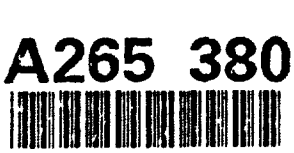

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The Naval Weapons Evaluation Facility (NWEF), Albuquerque, N.M., was disestablished in 1993. This report documents the history of NWEF from its establishment under the Bureau of Ordnance until its closure. Major projects and relationships with other nuclear-weapons-related agencies are included.

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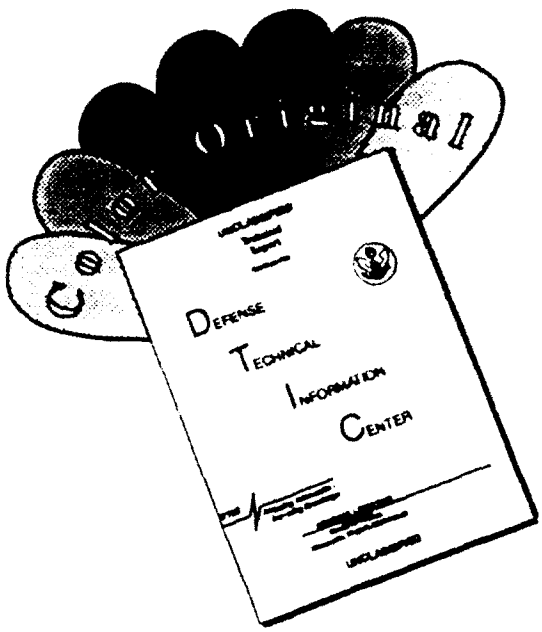

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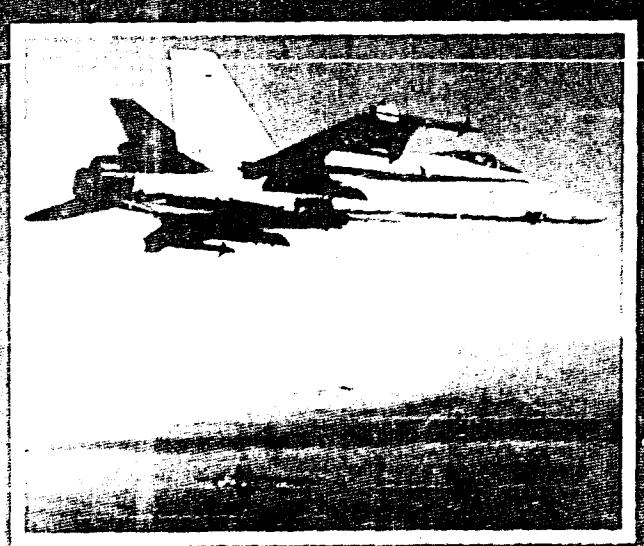
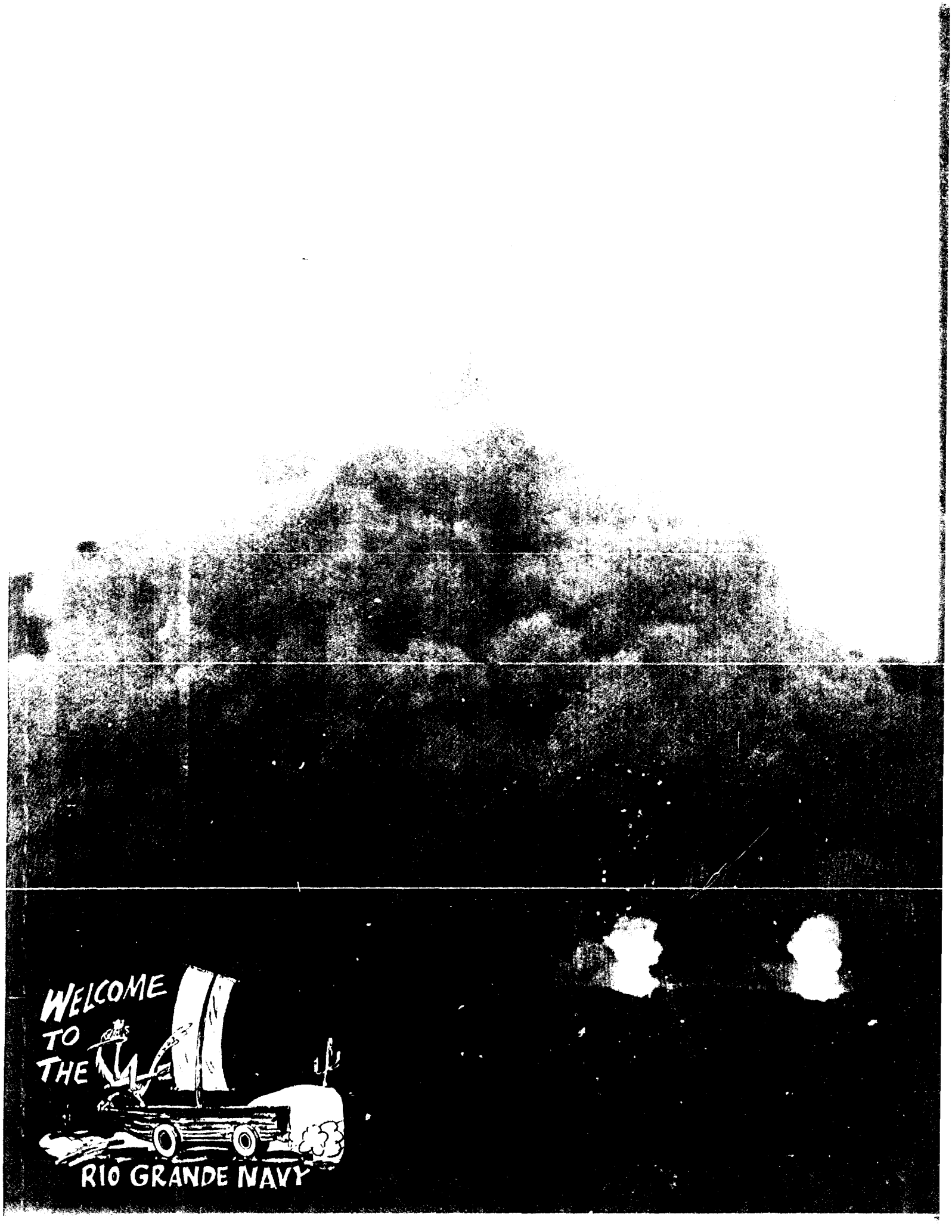
1948-1993

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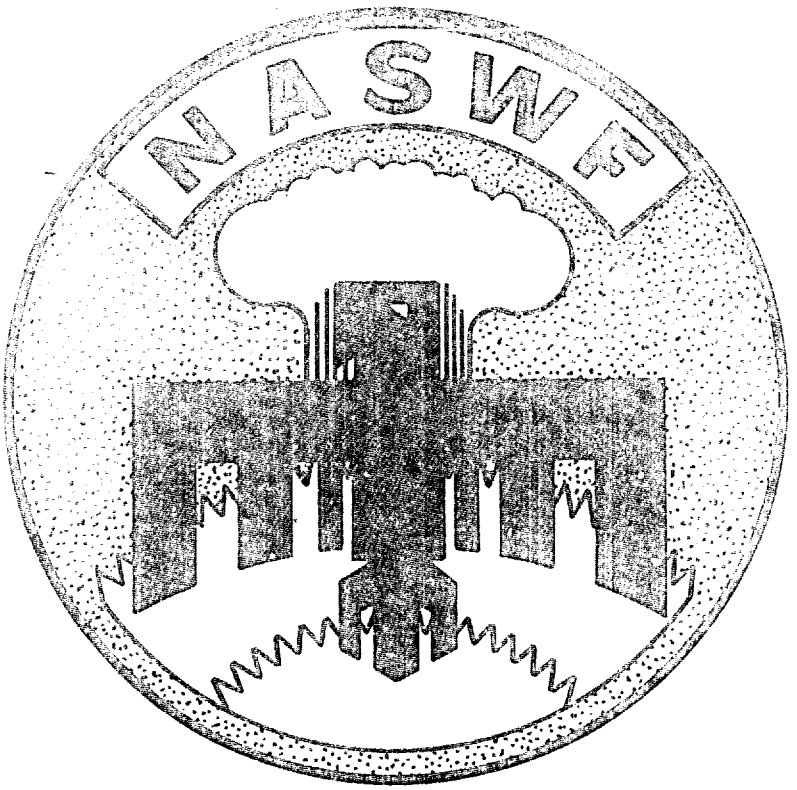

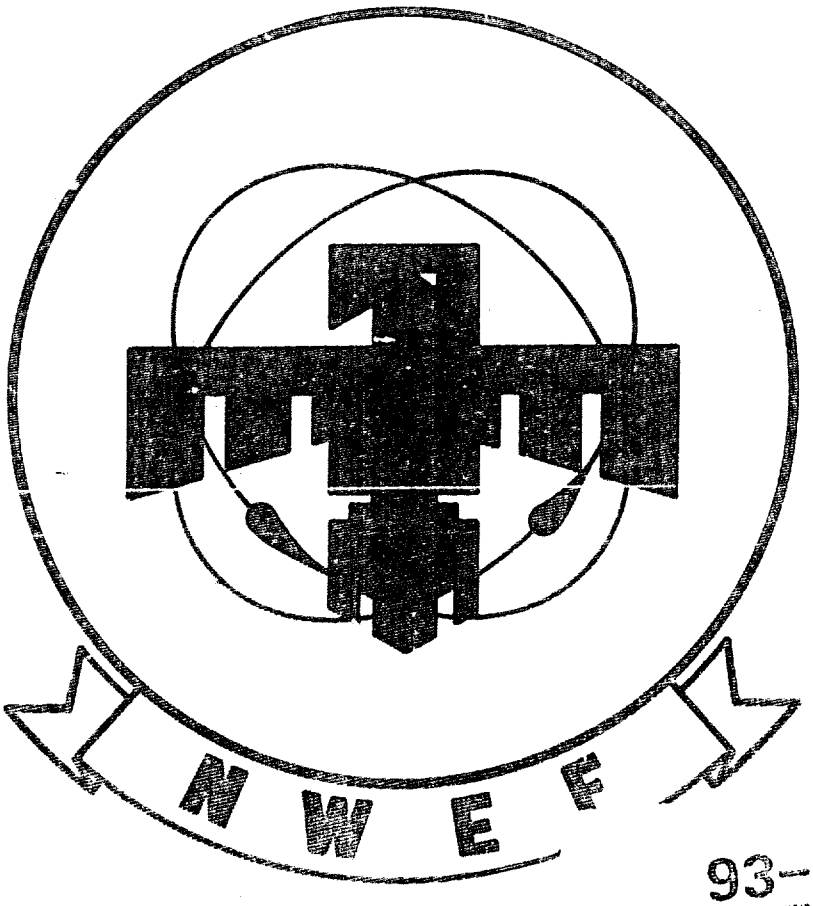

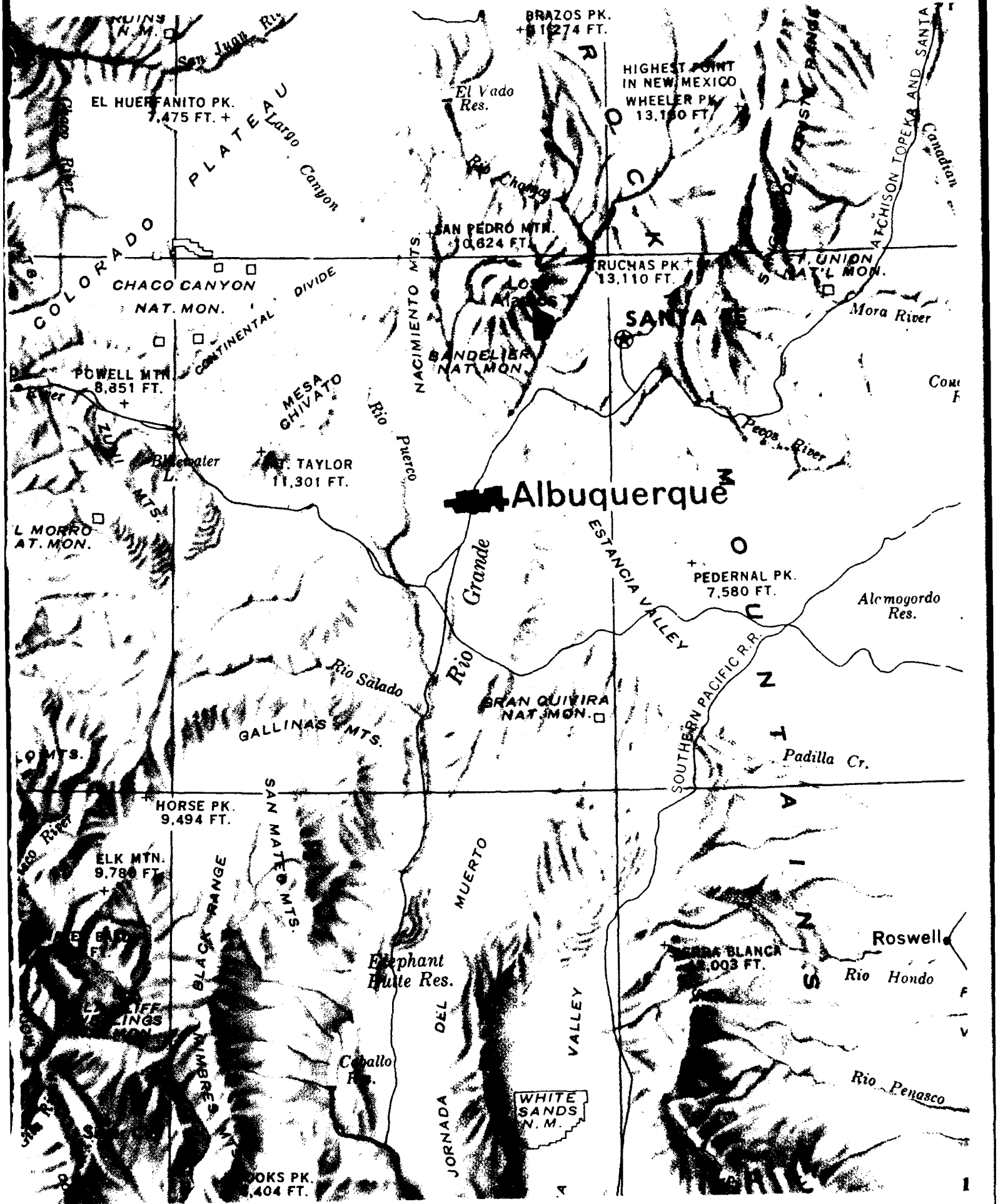
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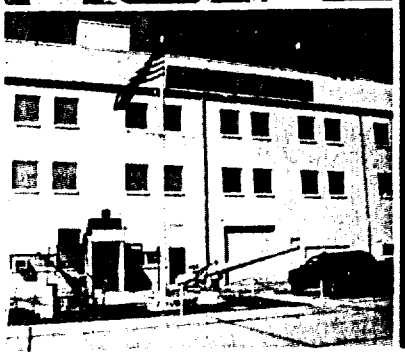
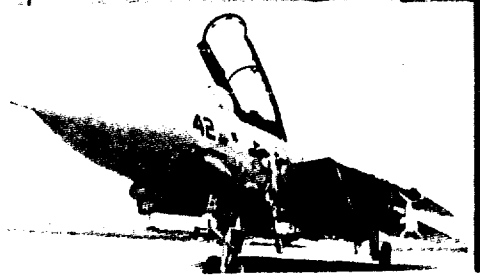
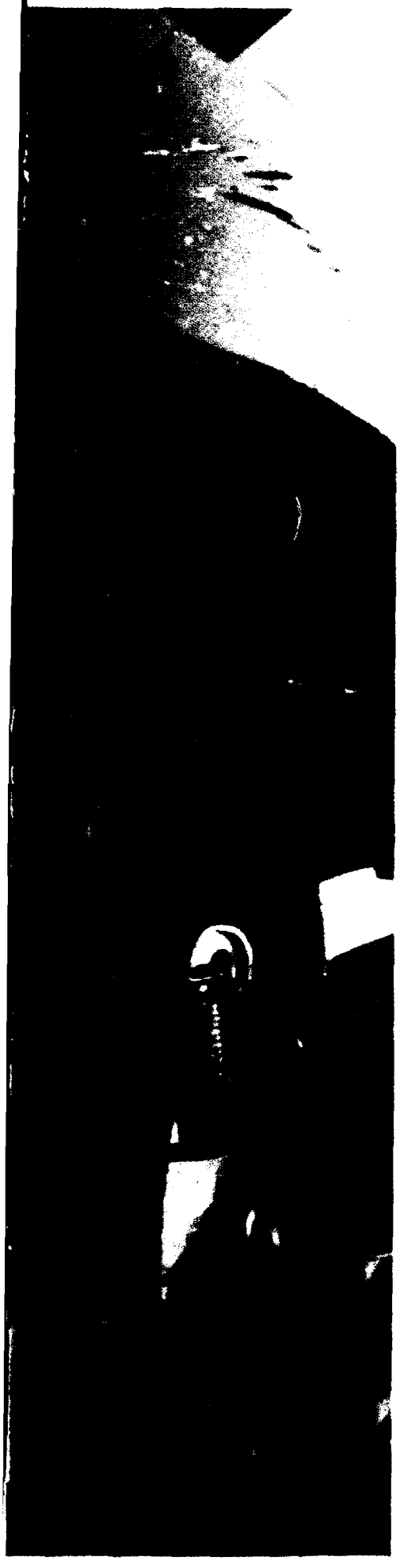




FLY NAVY

"Wings of Gold"



The Naval Weapons Evaluation Facility (NWEF) for over 40 years has been a mainstay of the Navy's nuclear-weapon program and an integral part of the Nation's strategic deterrent. Conceived in the aftermath of World War II and growing as the Cold War intensified, NWEF followed the course determined by the global political climate and the Navy's increasing role in deterrence and superpower stability. Today, with the Cold War essentially ended and the face of U.S. defense changing, NWEF has successfully completed the job for which it was created. Although the Facility is closing, the work that was performed here will be long remembered as a vital contribution to the Nation's—and the Free World's—defense.

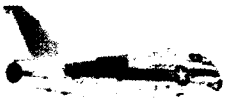
Nuclear-weapon evaluation, nuclear safety, and development and management of loading documentation for nuclear and conventional weapons were the most critical NWEF missions over the years. The Facility's earliest goal was to provide naval aircraft with nuclear-weapon capability. Ensuring the safety of the nuclear arsenals of the Navy and other services became a predominant part of NWEF's mission in the early 1960s.

Nestled in a corner of Kirtland Air Force Base southeast of Albuquerque, New Mexico—5,000 feet above sea level and over 900 miles from the nearest ocean—NWEF was dubbed the "Rio Grande Navy" by its sailors and civilians. More than most naval activities, NWEF was required to work with other government organizations, with industry, and with other branches of the armed forces, but the Facility managed to maintain its Navy identity nevertheless: on the side of its enlisted quarters, right in the heart of Air Force territory, NWEF once sported a huge sign that read "FLY NAVY." The blue-and-gold "U.S. Navy" sign still stands 10 feet tall on top of the hangar where most NWEF employees were housed.

By the nature of its mission, NWEF was a forerunner of the cooperative relationships so encouraged today among branches of the armed forces and other government entities. From the Facility's early days, Navy and civilian personnel and contractor representa-

Mk 101 "Lulu" loadup on HSS-1.

NWEF air arm, circa 1965: US-2, C-54, C-47, A-6s, A-3, TF-9s, A-5, and A-4s.



Special weapon retarder-parachute drop test.

tives worked together in close quarters, and NWEF personnel communicated with many government agencies at many levels. This spirit of cooperation was evident from a 1952 mission statement, which directed the then-Naval Air Special Weapons Facility (NASWF) to work in concert with Sandia Corporation, the Armed Forces Special Weapons Project, and the Atomic Energy Commission.

As a tenant activity on Kirtland Air Force Base, NWEF occupied roughly 7 acres and at its peak had over 53,000 square feet of laboratory and administrative space and almost 95,000 square feet of hangar space. Almost every type of Navy nuclear-capable fighter and attack aircraft passed through NWEF. In 1975 NWEF achieved 17,000 accident-free flight hours; in the seven-and-a-half years of flight time accumulated toward this record, NWEF pilots flew 22 versions of 12 different aircraft types. Aircraft that displayed NWEF's distinctive Thunderbird logo during this period included the A-3B, A-4E, A-4M, A-5A, A-6A, A-6C, A-6E, A-7A, A-7C, C-54, C-118, F-4B, F-4J, KA-6D, S-2F, TA-4, TF-9J, and OV-10. (See the illustration showing all aircraft assigned to NWEF.)

NWEF's major projects covered the spectrum of air-, surface- and subsurface-launched nuclear weapons and joint Army/Marine Corps amphibious nuclear weapons. NWEF also performed evaluation of some nonnuclear weapons and weapon systems. Emphasis was on stockpile-to-target support: every aspect of a weapon's environment, from handling and loading to accident-prevention to aircraft compatibility and carriage to tactics, was supported by NWEF.

As the facility in charge of the Navy's Nuclear Weapons Safety Program, NWEF conducted extensive studies of nuclear-weapon vulnerability—that is, the effects upon nuclear weapons of environmental extremes such as heat, cold, shock, and radiation—and used the results to establish safety standards and handling procedures for the Fleet as well as to recommend improvements for future weapon designs. Studies were also conducted to improve procedures dealing with weapon handling, loading, accident-prevention, and fire safety. Other safety-related projects included developing hardware and procedures to prevent weapons from accidentally arming, creating micro-

electronic logic systems to disable weapons if tampering was detected, developing procedures for emergency destruction of nuclear weapons, and investigating all nuclear accidents or incidents so that future problems could be avoided.

Safety issues were also the force that led to NWEF's development, management, and maintenance of Airborne Weapons/Stores Loading Manuals (AWSLMs) and assorted checklists for conventional- and nuclear-weapons stores. Initial nuclear-weapon integration with Navy aircraft established a need for checklists that dictated safe procedures. In addition, after several conventional-ordnance-related disasters aboard U.S. Navy ships, decision makers enlisted the aid of independent Navy personnel to consolidate and verify the sometimes conflicting published data on such ordnance and to provide mandatory, specific procedures for personnel who handled ordnance. In July 1966 NWEF took on responsibility for certification of procedures, eventually developing AWSLMs and associated checklists as well. The AWSLMs are aircraft-specific operations manuals for integrating a weapon or store with the aircraft weapon system. The Fleet uses AWSLMs at each aircraft weapon or store loading evolution and as the basis for Fleet aircraft ordnance professional training.

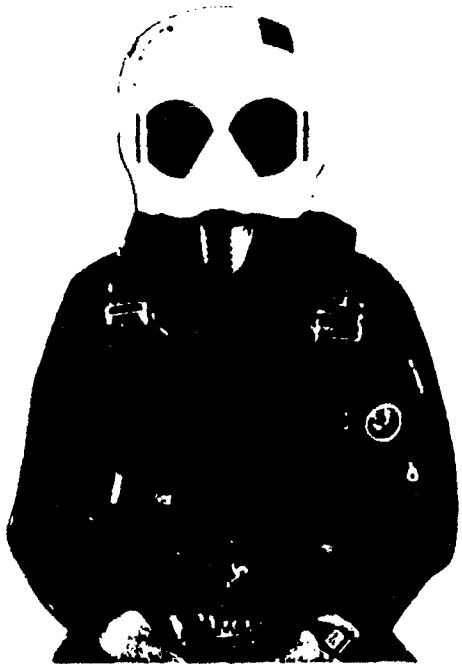
Review of weapon-handling procedures led NWEF into varied areas of work. Of great concern aboard ships carrying nuclear weapons is inherent radiation (INRAD). To combat this problem and ensure the safety of shipboard personnel, NWEF studied INRAD effects, devised systems for sailors to calculate INRAD levels resulting from various ship loadouts and stowage patterns, and investigated the possibility of providing INRAD protection in the weapon shipping containers.

Another ongoing element of NWEF's mission was regular safety reviews of all the Navy's antisubmarine warfare (ASW), Navy tactical air-delivered, and non-U.S. North Atlantic Treaty Organization (NATO) air-delivered ASW nuclear-weapon systems. As part of the nuclear safety program, NWEF was also called upon for trouble-shooting, such as helping to investigate an electrostatic buildup and discharge problem at a Polaris Missile facility.

Weapon-handling procedures: BDU-12 loadup.

Mk 82s being loaded on A-6E.

"Misty Picture," 1986.



Tests to determine pilot and aircraft response in nuclear combat were also part of the Facility's activity. NWEF entered early into areas of endeavor that would develop over the years into the broadly applied fields of human factors and aircraft survivability. Early in its history, NASWF was participating in the nuclear tests at the Nevada Test Site and at Eniwetok Proving Ground in the Pacific; the Facility concentrated on aircraft-survivability studies. During the 1955 Operation Teapot in Nevada, one of NASWF's tasks was to evaluate the effects of radiation on paint samples on the side of an aircraft exposed to a nuclear blast; the white and off-white paints were observed to see which could best withstand the intense heat and radiation. NASWF pilots and aircraft participated in Operation Redwing at Eniwetok in 1956 and Operation Plumbbob in Nevada in 1957. During Operation Plumbbob, FJ-4, HSS-1, and A4D-1 aircraft flew close to nuclear blasts to determine the planes' response to the shock wave and radiation. The data gathered during these tests were used to improve theoretical prediction methods for wartime missions.

Years later, in the 1970s, NWEF conducted a study known as Dice Throw for the Defense Nuclear Agency to determine A-4 aircraft structural response to overpressure, blast, and thermal effects; a simulated nuclear blast was used in testing. Similar tests were performed for other aircraft: Direct Course used a simulated 1-kiloton blast to test overpressure and blast effects against the F-4, and Misty Picture used a simulated 8-kiloton blast against the A-7.

Pilot safety in the nuclear-weapon-delivery environment has always been of paramount importance, and in the early 1970s NWEF also conducted extensive tests of thermal radiation closures (TRCs) installed on A-4, A-6, and A-7 aircraft. The TRCs had accordion-type segments that would close off the cockpit so that light and heat generated by a nuclear blast would not pass through the transparent canopy and affect pilot performance. NWEF testing established TRC closure times, resistance to thermal energy, and ability to eliminate light to the cockpit.

NWEF engineers worked closely with Sandia National Laboratories to develop eye-protection

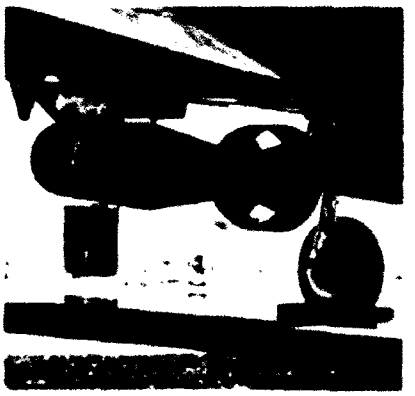
devices and evaluated several early concepts that evolved into the highly successful plumbum (lead)-lanthanum-zirconium-titanate, or PLZT, goggles. The polarized PLZT lens changes to allow transmission only of a specific light intensity as incident light increases. The change occurs almost instantaneously, allowing a user to watch a flashbulb filament glow when the flash is set off in front of the user's face.

NWEF's extensive experience and expertise in weapon ballistics led to the Facility's involvement in a variety of conventional-weapon projects, including ballistic comparisons of Mk 80-series bombs with and without thermal protective coating; fragmentation patterns of area weapons such as Rockeye; and ballistic comparisons of Mk 76 practice bombs supplied by various manufacturers.

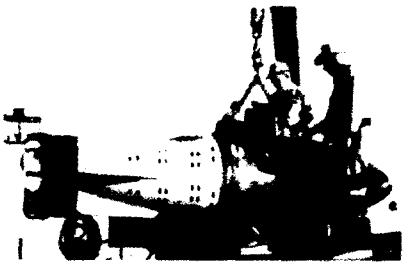
Rapidly developing Albuquerque expertise in the mid- and late '50s with air- and surface-delivered ASW weapons (such as the "Betty" (Mk 90) and "Lulu" (Mk 101) nuclear depth bombs) led to active involvement with such conventional ASW programs as the Mk 52, Mk 55, and Mk 56 mines. Air-deliverable like their special-weapon counterparts, these large, complicated weapons required specialized expertise in ballistics, handling, safety, and logistics.

As the U.S. stockpile of World War II-era mines became obsolete, the Navy developed a series of modifications to turn standard bombs into "Destructors," shallow-water bottom mines, to fill the gap between the large moored mines and torpedoes. NWEF's experience in supporting nuclear depth bombs and other mines led to the Facility's involvement with the Mk 36, Mk 40, and Mk 41 destructors (Mk 82, 83, and 84 bombs, respectively) and with Quickstrike, the follow-on shallow-water mine, and CAPTOR, the advanced captive-torpedo (Mk 46) deep-water-mine.

Other conventional-weapon programs and related projects with which the Facility became involved included fuel-air explosive (FAE) weapons, the ADSID V 2.75- and 5.00-inch rockets, retarder-parachute test units, safety analysis of the Close-In Weapon System (Phalanx) control system, Mk 46 decoy flares, Mk 25/58 marine markers, and AN/AWM-16, -38, and -97 airborne radar/fire-control test sets.



Mk 101 "Lulu" on AD-4 ready for flight test



Mk 90 "Betty" test setup

Submarine-launched Tomahawk.

ASROC firing at sea.

Trident I test launch.

NWEF's primary emphasis, however, remained on special weapons, including work on the Polaris, Poseidon, and Trident submarine-launched ballistic missile systems. NWEF also conducted studies on the nuclear versions of surface-launched weapons—Talos, Terrier, and the Antisubmarine Rocket (ASROC)—and submarine-launched weapons—Submarine-Launched Antisubmarine Rocket (SUBROC) and Sea Lance—and performed life-cycle-cost studies for nuclear Harpoon. Ongoing involvement with the Tomahawk weapon system included conducting nuclear safety studies, reviews, and evaluations on the nuclear variant and its interfaces with surface weapon control systems (Tomahawk Weapon System Mk 36, Tomahawk Weapon System Mk 37, Aegis Combat System, and Vertical Launching System) and submarine combat-control systems (CCS Mk 1, CCS Mk 2, AN/BSY-1, and AN/BSY-2), as well as participating as a member of the Tomahawk technical evaluation team. The graphics show examples of major NWEF programs and weapon-platform integration projects.

In the 1970s NWEF supported Sandia National Laboratories in developing the Extended Range Bomb (ERB). This entirely new concept for delivery of nuclear weapons increased aircraft target-area escape time. NWEF conducted captive-flight tests to evaluate instrumentation, ballistics, and guidance-system and control-surface calibration of the ERB. During the same time period, NWEF conducted several successful flight tests of Tiger II, a bomb with a small engine, a simple orientation and navigation system, and controllable fins for in-flight corrections. When dropped, Tiger II flew in a huge circular pattern back to its release point and then detonated at the desired altitude, giving the delivery pilot considerable escape time to travel a safe distance.

In January 1974, a unique partnership was formed under a Navy-Air Force agreement when the first naval officer was assigned to NWEF to work on the Air Force high-energy-laser project. The Naval Sea Systems Command authorized NWEF to administer the Navy's participation in the laser project at the Air Force Weapons Laboratory at Kirtland; other naval officers soon joined the project. Navy involvement in this project eventually led

to the development of a Navy high-energy-laser air-weapon project.

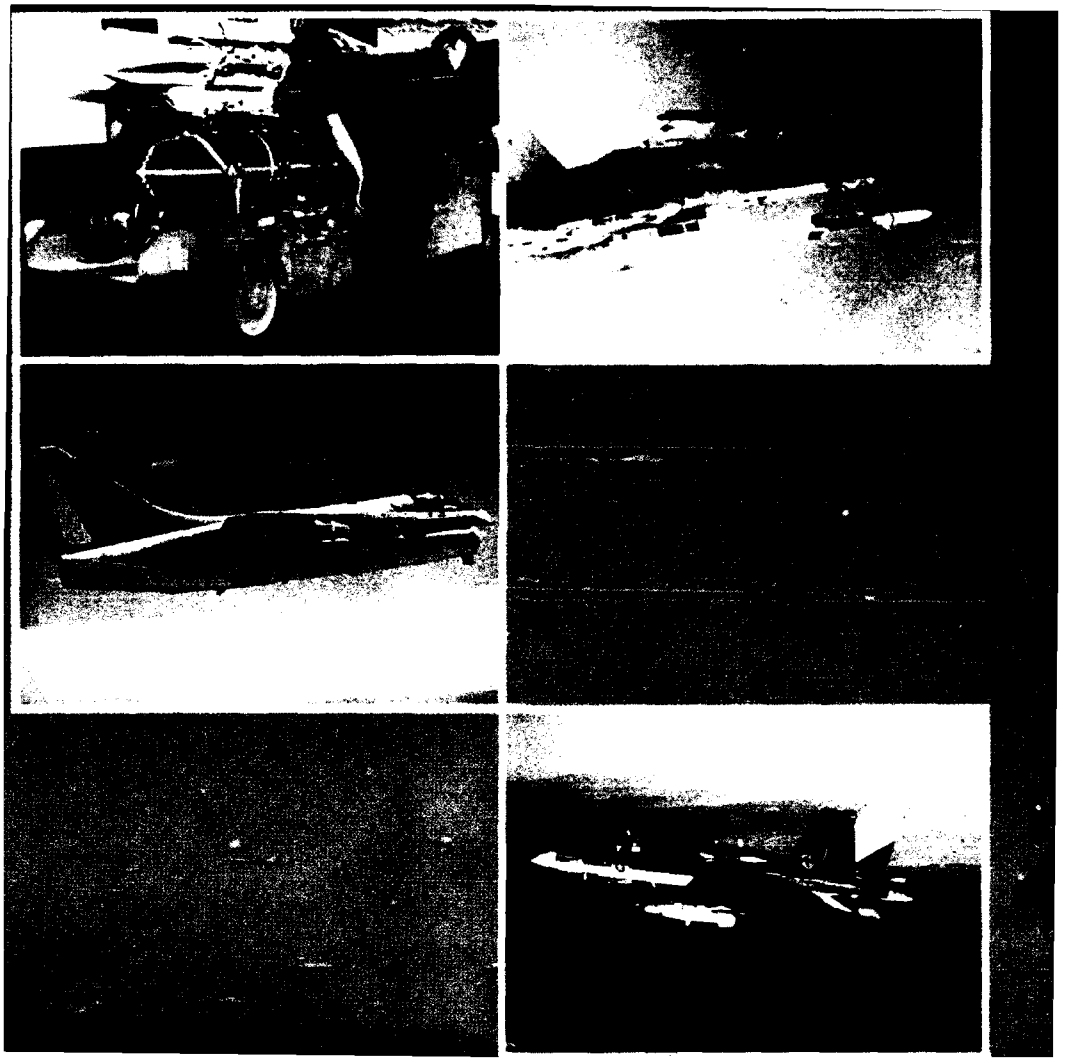
Publications became one of the Facility's major products. In any laboratory or development project, the first and last product is the documentation package; in dealing with nuclear weapons and their handling procedures, accurate documentation is especially critical. The need for thorough documentation for both nuclear and conventional weapons was emphasized in the mid 1960s as the Nation was gearing up for full-scale activity in Southeast Asia. The U.S. Navy, a major player in that action, positioned aircraft carriers in the Gulf of Tonkin; a series of fires and explosions on these carriers indicated an urgent need for safer handling of weapons and ordnance. NWEF proposed to the Navy a checklist that complemented the loading manual and that could be used during high-tempo operations, such as on the carrier deck with engines running and during wartime turnaround of the aircraft. Since the first checklist was published, no other fires or major accidents have occurred during the handling or loading of weapons. The loading manuals and checklists became important NWEF products, in addition to the Facility's other types of weapons documentation: weapons assembly manuals, the Airborne Weapons Support Equipment series of manuals, and publications on new or modified operational conditions or requirements—ten thousand pages a year in all. NWEF set the standard for aviation ordnance safety and weapon compatibility for Navy and Marine Corps aircraft.

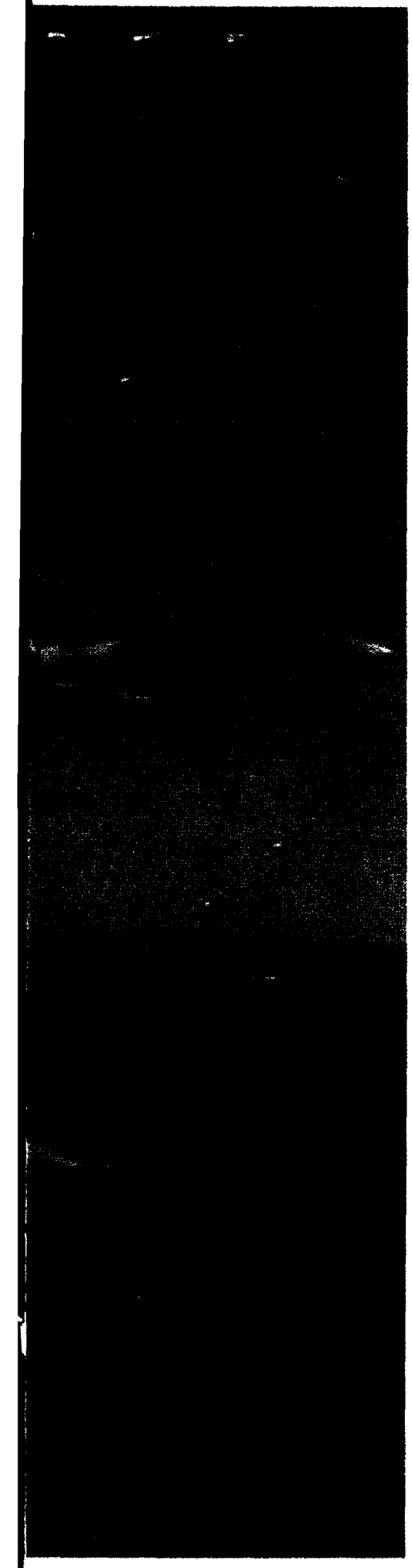
In 1966 the Technical Publication Department was formed as part of the Aircraft Ordnance Department, with an initial cadre of one gunner's mate, two aviation ordnance specialists, and one yeoman to type the checklists and other correspondence. More personnel and responsibility for more publications were added throughout the 1970s and '80s; the publications group transferred to China Lake in 1993 as the largest identifiable unit of NWEF and continues to serve the Fleet as the foremost Navy authority on weapons and weapons loading publications.

U.S.S. Enterprise flight-deck fire.

Double-checking weapons for loading.

Safety procedures: fire equipment on runway.





NWEF's Mission of Deterrence

NWEF made the transition from the nuclear fervor of the 1950s, when the majority of the Nation's military organizations were focusing on building the nuclear arsenal and providing our armed forces with nuclear capability, to the 1960s, when the emphasis once again returned to conventional weapons and the concept of limited warfare. The transition had little effect on NWEF's nuclear-weapons-related mission. Although the names of NWEF's departments changed over the years, the missions of the departments as they were organized in the late 1960s provide insight into NWEF's place in the Navy's nuclear program during this critical period.

The Aircraft Projects Department was concerned with aircraft that deliver nuclear weapons. Department studies helped establish new concepts and design criteria for developing improved aircraft-delivered nuclear weapons. As part of its mission, the Department planned and coordinated flights involving nuclear and nonnuclear weapons, including aircraft-separation and trajectory-data tests. The Department also monitored the development of all aircraft-delivered nuclear weapons and evaluated them for possible use on Navy aircraft. As the primary Board of Inspection and Survey activity designated to certify new aircraft, including the A-6E, A-7E, and F/A-18A, for nuclear-weapons delivery, NWEF conducted extensive system evaluations, fit tests, and loading and handling tests to ensure proper fit and function of all on-board and ancillary equipment. The Aircraft Projects Department scheduled flight tests of these aircraft to evaluate and approve delivery maneuvers and delivery accuracy, aircraft and bomb vibration characteristics, aircraft and bomb arming and release system function under normal and extreme delivery environments, and aircraft safe-escape capability.

The Aircraft Ordnance Department performed test and evaluation of loading and handling equipment and procedures for nuclear and nonnuclear weapons.

Military-civilian teamwork: weapon checkout.

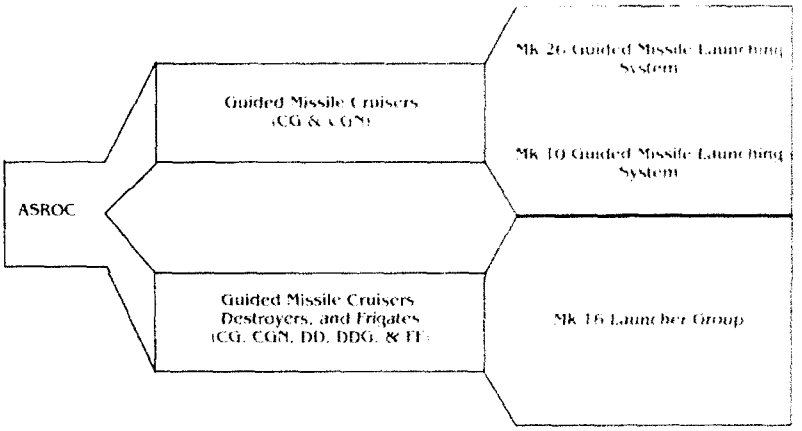
Air power at sea.

Aircraft systems check.

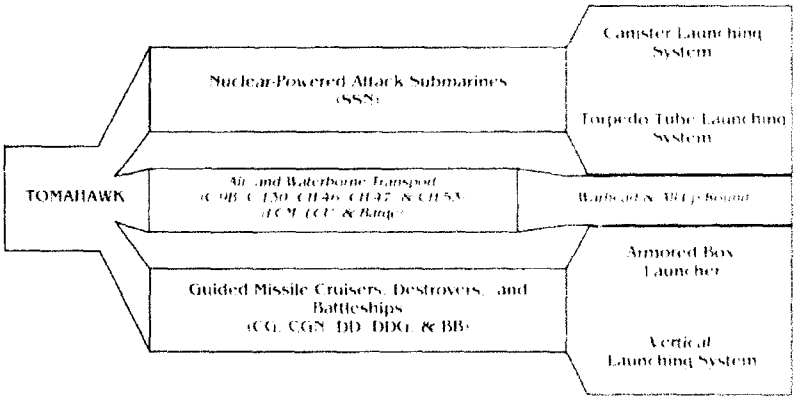
Mk 61 loading and handling.

Along with the Aircraft Projects Department, the Aircraft Ordnance Department also evaluated nuclear-weapon suspension and release systems in naval aircraft and studied shipboard environmental problems related to arming aircraft with nuclear and nonnuclear weapons. In an extensive project, NWEF conducted in-house and shipboard tests to certify a newly designed bomb hoist to be used in the nuclear-weapon storage spaces aboard the U.S.S. Nimitz (CVN 68).

The Weapons Systems Environments Department conducted studies of the vulnerability of nuclear



NWEF supported the installation and or operation of the nuclear-capable version of the ASROC weapon system in three different launcher configurations on nearly 120 ships of some 20 classes of five different types.

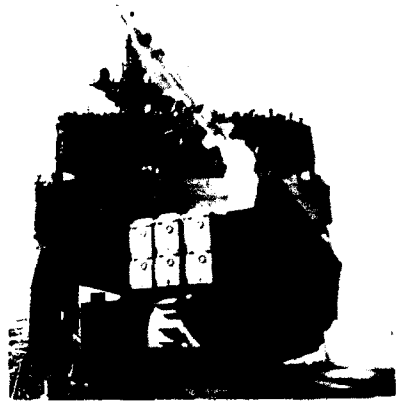


NWEF supported the installation and or operation of the nuclear-capable version of the Tomahawk Cruise Missile weapon system in four different launcher configurations on a wide variety of ships, ranging from nuclear submarines to battleships. NWEF also supported the development of nuclear Tomahawk transportation capabilities aboard logistics support ships and aircraft.

weapons, including the effects of electromagnetic radiation, blast, fragmentation, fire, and nuclear explosions. The Department prepared procedures and designed components to aid in the emergency destruction of nuclear weapons. The Department's civilian mathematicians, physicists, and engineers also studied new and advanced weapons for the Navy.

Existing in some form since the early 1950s, the Surface, Subsurface, and Amphibious Weapons Department concerned itself not with aircraft-delivered weapons but with weapons carried and launched by ships, with nuclear projectiles and artillery shells, and with atomic demolition devices used by the Navy and Marine Corps. The Department planned and conducted safety studies for all surface-launched, subsurface-launched, and amphibious nuclear-weapon systems of interest to the Navy. The Department also prepared handbooks and information about nuclear safety.

The Nuclear Safety Staff (later the Nuclear Weapons Safety Department) planned and coordinated the Navy Nuclear Weapons Safety Program. This job involved scheduling and coordinating safety studies on nuclear-weapon systems and conducting safety symposia to emphasize the need for awareness of nuclear-safety issues. The Staff provided technical assistance on problems relating to the safety of nuclear weapons and published a quarterly safety magazine, Nuclear Weapons Safety.

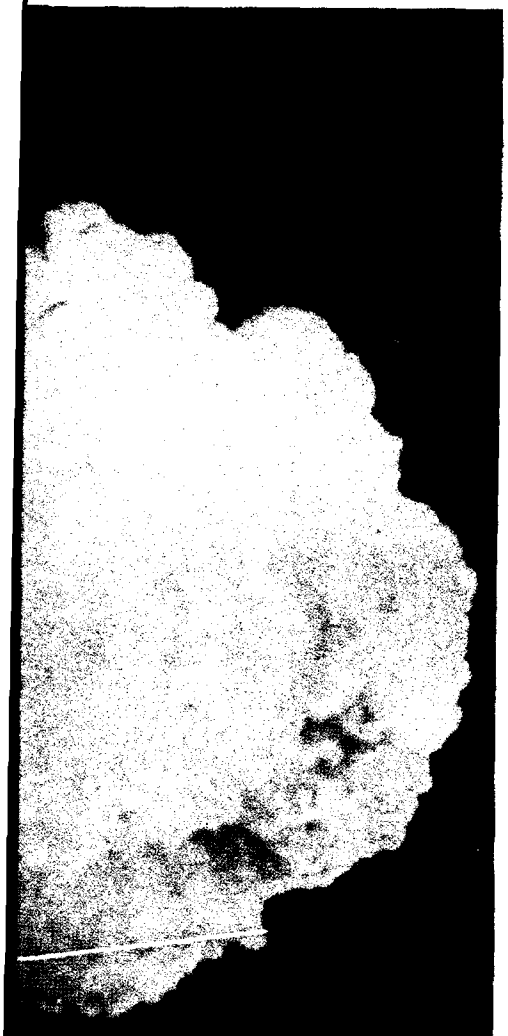


Harpoon launch at sea, 1983.

Tomahawk during test flight.

Aircraft type	Weapons supported	Time frame
AD/A-1 models	Mk 7, 8, 12, 91 bombs Mk 92 trainer Mk 101 (Lulu) depth bomb Mk 105 (Hotpoint) weapon	1952-65
A3D/A-3 models	Mk 4, 5, 6, 7, 15, 18, 27, 39 bombs Mk 105 (Hotpoint) weapon	1960-63
A4D/A-4 models (incl. TA-4F)	Mk 7, 8, 12, 91 bombs B 28, 43, 57, 61 bombs Mk 105 (Hotpoint) weapon	1958-86
A-6 models (incl. KA-6D)	B 28, 43, 57, 61 bombs	1959-93
A-7 models	B 28, 43, 57, 61 bombs	1964-91
F4H/F-4 models	B 28, 43, 57, 61 bombs	1960-70
S-2 models	B 57 bomb Mk 90, 101 (Betty, Lulu) depth bombs	1957-76
SH-3 models	B 57 bomb Mk 101 (Lulu) depth bomb	1961-93
Maritime patrol aircraft (P-2, P-3, P-4, P-5)	B 57 bomb Mk 90, 101 (Betty, Lulu) depth bombs	1960-93
NATO aircraft		1961-92
Can. (P2V, CS2F, Argus)	B 57 bomb; Mk 101 depth bomb	1961-64
U.K. (Shackleton, Nimrod)	B 57 bomb; Mk 101 depth bomb	1963-92
Neth. (NSP 2H, P-3C)	B 57 bomb	1967-92
Italy (IS 2F, Atlantic)	B 57 bomb	1970-92

Representative examples of special weapons and aircraft combinations supported by NWEF efforts, 1952-1992

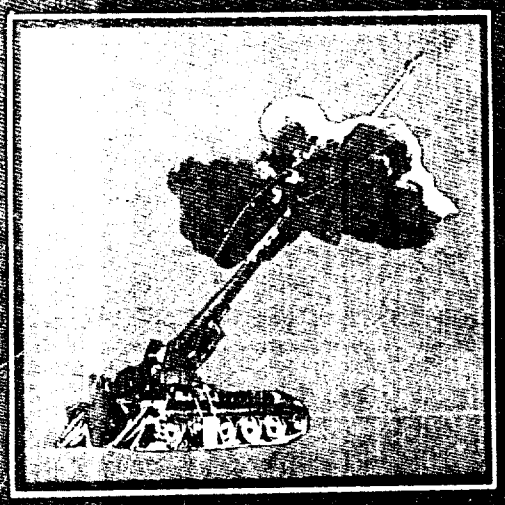


"The Legacy of Crossroads . . ."

By the late 1940s, the face of U.S. defense was changing rapidly and radically. The atomic bomb had been used successfully in World War II, and the armed forces were integrating nuclear weapons into the Nation's strategic defense. In July 1946, this first series of Pacific nuclear tests was conducted at the Bikini Atoll; involving air and underwater detonation of weapons against an array of ships as targets, "Operation Crossroads" was the first large-scale test of nuclear-weapons effects. Projects like Crossroads were leading the way toward a nuclear-oriented future for the U.S. armed forces—and a nuclear-oriented future for world politics. The lines that would for the next half-century define East-West relations and the coming decades of Cold War were being drawn even as the World War II Allies celebrated their victory; those lines would be held by "strategic weapons."

To oversee the integration of nuclear weapons into the armed forces, the Department of Defense created the Armed Forces Special Weapons Project (later to become the Defense Nuclear Agency). The Project's role was to advise the Secretary of Defense and Joint Chiefs of Staff on matters concerning nuclear weapons and the effects of nuclear radiation. Although the Air Force was the service primarily concerned with the capability of aircraft to carry and deliver nuclear weapons—it established a separate organization, the Air Force Special Weapons Command, at Kirtland Air Force Base in 1949—the Navy needed to investigate nuclear capabilities for naval aircraft as well.

To forge a connection between naval aviation and the Armed Forces Special Weapons Project, which was operating the Sandia Base at Albuquerque, the Department of the Navy commissioned a U.S. Naval Air Detachment at Albuquerque in June 1949. The Detachment's mission was to provide specified naval aircraft with nuclear-bomb carriage and delivery capability. With just three



Mk 1 BOAR
SRAM-T
SITAN

Tomahawk

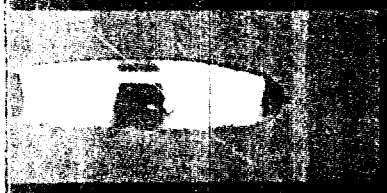
Talos	(W30)	8-Inch AFAP	(W33/W79)
Terrier	(W45)	155-mm AFAP	(W48/W82)
Standard	(W81)	SADM	(B54)
ASROC	(W44)	MADM	(W45)

AD/A-1 Skyraid
AJ/A-2 Sava
A3D/A-3 Skywarri
A3J/A-5 Vigilan
A4D/A-4/TA-4 Skyhaw
A-6/KA-6 Intrud
A-7 Corsair
AV-8B Harri
A-12 Aveng
FJ4/AF-1 Fu
F2H/F-2 Bansh
F3H/F-3 Dem
F7U Cutla
AX Adv
Shackleton (U.K.) Nimrod M
IS-2F (Italy) Atlantic

Mk 4
Mk 5
Mk 6
Mk 7
Mk 8
Mk 12
Mk 15
Mk 18

B27
B28
B43
B57
B61
B90

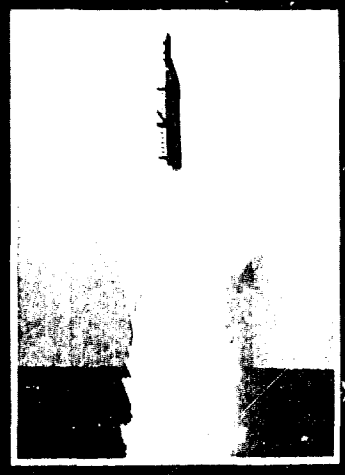
NS SUPPORT PROJECTS, 1952-1992



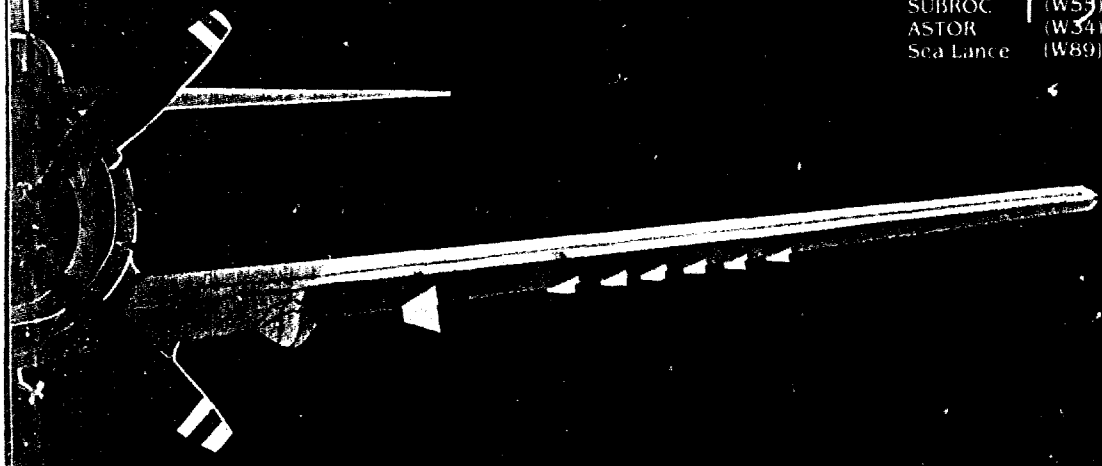
Harpoon

Phoenix

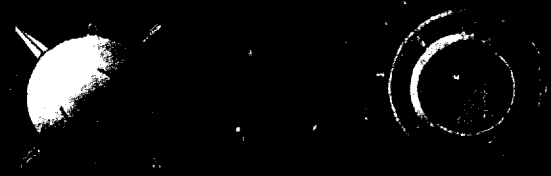
e missiles (W80)



Regulus I	(W27)	Polaris	(W47/W58)
SUBROC	(W55)	Poseidon	(W68)
ASTOR	(W34)	Trident	(W76/W88)
Sea Lance	(W89)		



F9F-8/F-9 Panther
F4H/F-4 Phantom II
F-14 Tomcat
F/A-18 Hornet
P2V/P-2 Neptune
P3V/P-3 Orion
P5M/P-5 Marlin
P-7 Patrol aircraft
S2F/S-2 Tracker
S-3 Viking
SH-3 Sea King
SH-34 Seabat
SV-22 Osprey
attack aircraft
P2V, CS2F-2 (Canada) Argus
SP-2H (Netherlands) RNLN P-3C



BDU-11	Mk 72
BDU-12	Mk 76
BDU-20	Mk 39
BDU-24	Mk 91
BDU-36	Mk 92
BDU-38	Mk 101
BDU-48	Mk 105
BDU-53	Mk 106

B	Bomb	Mk	Bomb or weapon system	ADM	Atomic demolition munition
BDU	Bomb simulator	W	Warhead	AFAP	Artillery-fired atomic projectile

Suited up for drop tests.

NASWF crew with F7U, 1957.

F7U dropping TX-11 "Elsie" (Mk 91).

Nuclear test photographed from aircraft.

aircraft (a P2V-2, an AJ-1, and a JRB-4) assigned to them, the seven officers and 19 enlisted men under CDR Thomas J. Walker evaluated new special-weapons shapes that had been developed at Sandia to determine the compatibility of weapons and aircraft. CDR (later VADM) Walker was a natural choice for the group, having been previously assigned to the Atomic Laboratory, Los Alamos, as a prospective Bomb Commander for the once-planned fourth atomic-bomb mission of World War II.

Determining compatibility required extensive testing of each aircraft-weapon combination; more people and different types of aircraft were needed. By June 1951, when CDR (later ADM) Frederick H. Michaelis became Officer-in-Charge, the Detachment had eight officers and 53 enlisted men. AD-4 and F2H-2 aircraft had been added to those being tested. The combination of new weapons and new weapon shapes with existing aircraft involved great effort in modifying equipment and adjusting and refitting aircraft-weapon interfaces.

Realizing the importance of naval aviation's continued presence in the special weapons field, the Chief of Naval Operations (CNO) urged an increased Navy presence at Albuquerque. The Naval Air Detachment was redesignated in August 1952 as the Naval Air Special Weapons Facility (NASWF), a unique Navy outfit with a unique mission. Michaelis became NASWF's first Commanding Officer, overseeing 23 officers, 177 enlisted men, and 11 aircraft transferred from the Naval Administrative Unit: five F2H-2s, two AD-4s, an F3D, an AJ, a JRB, and an F7F. The CNO-assigned mission of the new NASWF was to

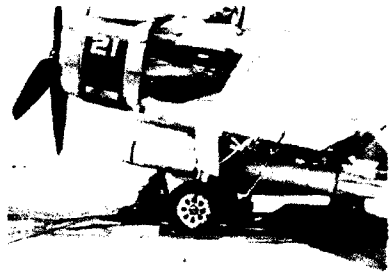
Participate in various programs to adapt special weapons to naval aircraft; represent the Bureau of Aeronautics in relations with the Sandia Corporation and the Field Command, Armed Forces Special Weapons Project; conduct special weapons tests in connection with AEC (Atomic Energy Commission) programs; and assist the Armed Forces Special Weapons Project with naval equipment for demonstrations and training.

The CNO also requested the Bureau of Ordnance to establish an acceptance program for nuclear weapons and associated

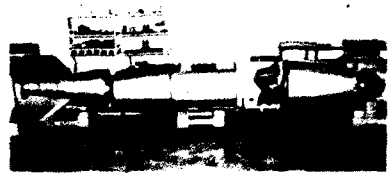
materials. The purpose of the program was to evaluate weapon systems' reliability, operability, safety, and suitability, and to recommend acceptance for Navy service use of designated atomic weapons and associated materials. The task of developing the acceptance program was assigned to the Naval Ordnance Test Station (NOTS, later the Naval Weapons Center) at China Lake, California, in July 1955.

NOTS and NASWF would prove an excellent pairing. NOTS China Lake, another desert naval activity that was establishing itself as the leader in conventional-weapons development and testing, had much in common with NASWF. Established in November 1943 with a staff of both Navy personnel and civilian scientists and engineers, NOTS was partially modeled on the also-isolated site of Los Alamos and had in fact provided critical support to the Manhattan Engineering District—the code name for the first atomic weapon project. From 1945, Project Camel, as the NOTS support effort was called, provided casting and machining of precise chemical explosive charges for atomic weapons as well as detonation testing, bomb-case design, air drops of bomb shapes from Army B-29 bombers, and checkout of equipment and procedures to be used in the tactical delivery of the first atomic bombs. In the late 1940s and early '50s NOTS supported a variety of nuclear-weapon projects such as Project Elsie, part of the Mk 91 nuclear-penetration-bomb-system development. During the 1950s, NOTS developed the Bombardment Aircraft Rocket (BOAR) 30.5-inch air-to-surface nuclear stand-off weapon (sans nuclear warhead) and made significant contributions to the Polaris missile program. CAPT W. S. Parsons, head of the Ordnance Division at Los Alamos, had been instrumental in bringing nuclear-weapon-support activity to NOTS China Lake.

NOTS quickly set up a separate group to deal with special weapons; the Special Weapons Evaluation Branch was established in the Rocket Development Department. This group was developed into the Nuclear Weapons Evaluation Division, and at Albuquerque during 1957, civilian engineers performed weapon acceptance tests and vulnerability stud-



Hotpoint loadup on AD, 1955.



Bombardment Aircraft Rocket (BOAR), 1957.

F2H-3 with BOAR, 1953.

F-84 with BOAR, 1953.

NASWF crew in front of FJ-4, HSS-1, and A4D.

ies. The acceptance program foreshadowed NWEF's later position as a leader in nuclear safety. The NOTS group's early tasks included initial evaluation of the Mk 12 Mod 1 Bomb, evaluation of new modifications and improvements to Mk 15 and Mk 39 weapons, and initial evaluation of missile components and subassemblies. The group also conducted a preliminary study for the "family-of-weapons concept," which involved using a standard weight and configuration for a family of weapons of different yields. With NOTS' expertise and experience working in concert with NASWF and the other members of the New Mexico nuclear community, firm foundations for the Navy's special-weapons team were well and quickly established.

In 1958, the NOTS China Lake branch was redesignated by the Bureau of Ordnance as the Naval Nuclear Ordnance Evaluation Unit (NNOEU) and was placed under command of NASWF's Commanding Officer. The Facility was soon given additional responsibility for communicating with the nuclear community on behalf of the Navy. Although NASWF already worked closely with the AEC, Sandia Corporation, and the Armed Forces Special Weapons Project, a new mission statement in 1959 tasked the Facility, in addition to evaluating nuclear-weapon systems for the Navy, to "represent and maintain liaison for the Bureau of Naval Weapons with all activities in the Albuquerque area concerning nuclear applications for weapons of interest to the Navy."

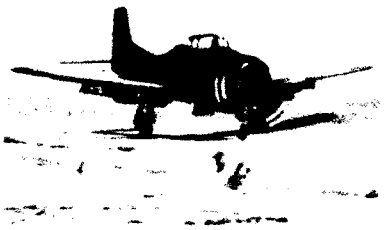
NASWF and NNOEU were combined in March 1961 as the Naval Weapons Evaluation Facility. NWEF was under management control of the Bureau of Naval Weapons, which had been formed by the combination of the Bureau of Ordnance and the Bureau of Aeronautics in 1959. In September 1968, NWEF was officially placed under management control of the recently formed Naval Air Systems Command (NAVAIR); NWEF's mission, however, continued to include critical responsibilities with regard to all Navy nuclear weapons.

Also in 1961, NWEF's mission significantly expanded to include the conduct of safety studies on nuclear weapons and "to render services as required to the Board of Inspection and Survey for the conduct of

trials of naval aircraft." NWEF also assisted the Board during Underway Material Inspections, Acceptance, and Final Contract Trials of Navy ships, furnishing inspectors for ships with nuclear-weapons storage and maintenance capability to ensure that equipment designated to handle or transport nuclear weapons was operating safely and efficiently. In this endeavor, NWEF quickly established itself as a critical player on the INSURV team and was well recognized for its meticulous inspection techniques by the Naval Sea Systems Command and the naval shipyards.

In 1963, NWEF was specifically granted authorization for direct liaison with the CNO in all matters involving nuclear safety. NWEF now had responsibility for the Navy's Nuclear Weapons Safety Program, which involved distributing safety information, investigating accidents, and assisting CNO in policy-making related to nuclear weapons. By 1968 NWEF's liaison role had again increased, and its mission required NWEF to "maintain direct liaison with all levels of command within the Navy and other government agencies with respect to nuclear weapon safety."

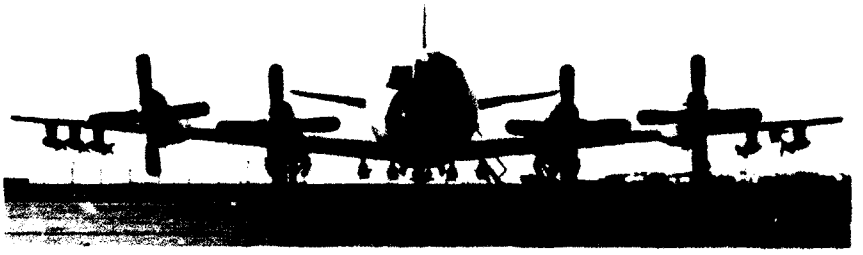
For almost 30 years beginning in September 1949, the Facility was under the area command of the Eighth Naval District. On 1 July 1979 NWEF was transferred to the area command of the Eleventh Naval District, San Diego. On 1 October 1980 NWEF was transferred to Commander Naval Base (COMNAVBASE) San Diego when the Naval Districts were disestablished.



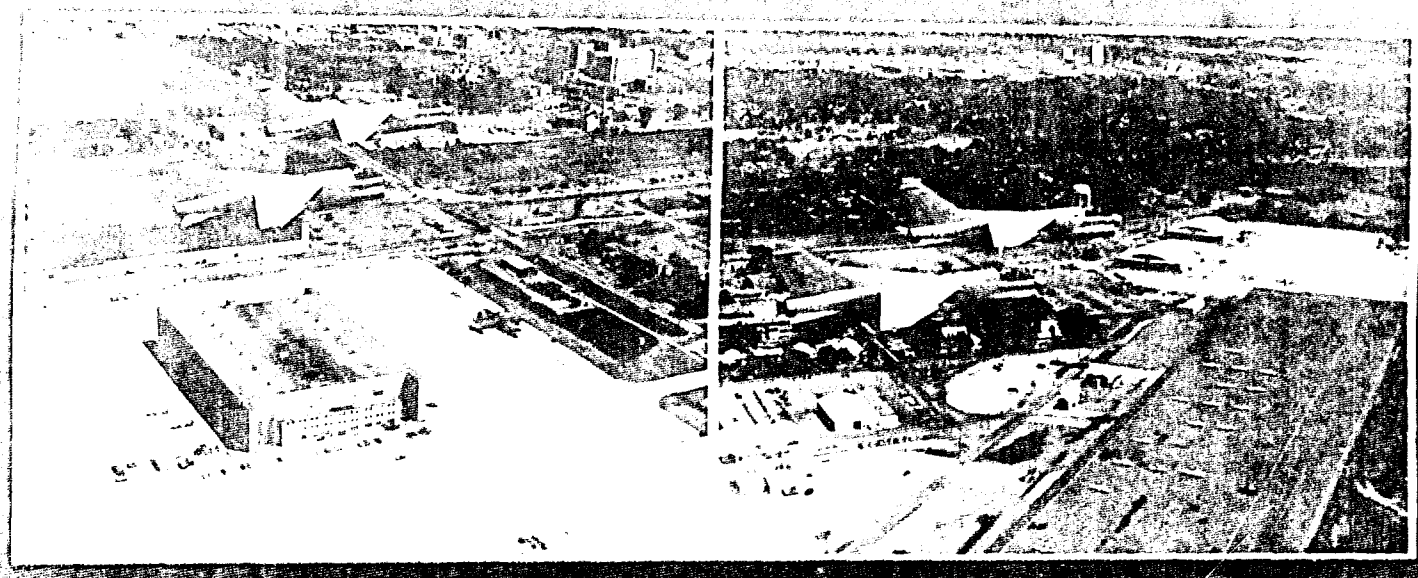
U.S.S. LE landing 1965

In 1992, with the consolidation of many naval activities and the drawdown of the U.S. defense budget, NWEF became part of the large, multisite Naval Air Warfare Center Weapons Division (NAWCWPNS).

NAWC
Weapons Division
NAVAL AIR WARFARE CENTER



Fully loaded P-3.



New Mexico's Nuclear Community

NASWF was created into an already well-established special-weapons community—sited on Kirtland Air Force Base, within sight of Sandia Base, and right down the road from Los Alamos. Kirtland AFB had grown from several small airfields and military bases around Albuquerque. In the late 1930s Albuquerque's municipal airport occupied a site near what is now the western half of the base. In 1939, the military leased 2,000 acres nearby on which to service transient military aircraft and planes to be ferried to Great Britain. Encouraged by Albuquerque's civic leaders to expand military aviation activity in the area, the Army soon created one of the largest U.S. bomber crew training bases at Kirtland Field, named for Army aviator Roy C. Kirtland.

A private airfield, Oxnard Field, lay to the east of Kirtland Field, and the U.S. Army Air Force established a training depot there known as Sandia Base. During the war, Sandia Base was used as a storage and dismantling facility for surplus aircraft; more than 2,000 planes were stripped and melted down for the aluminum they contained—over 10,000,000 pounds.

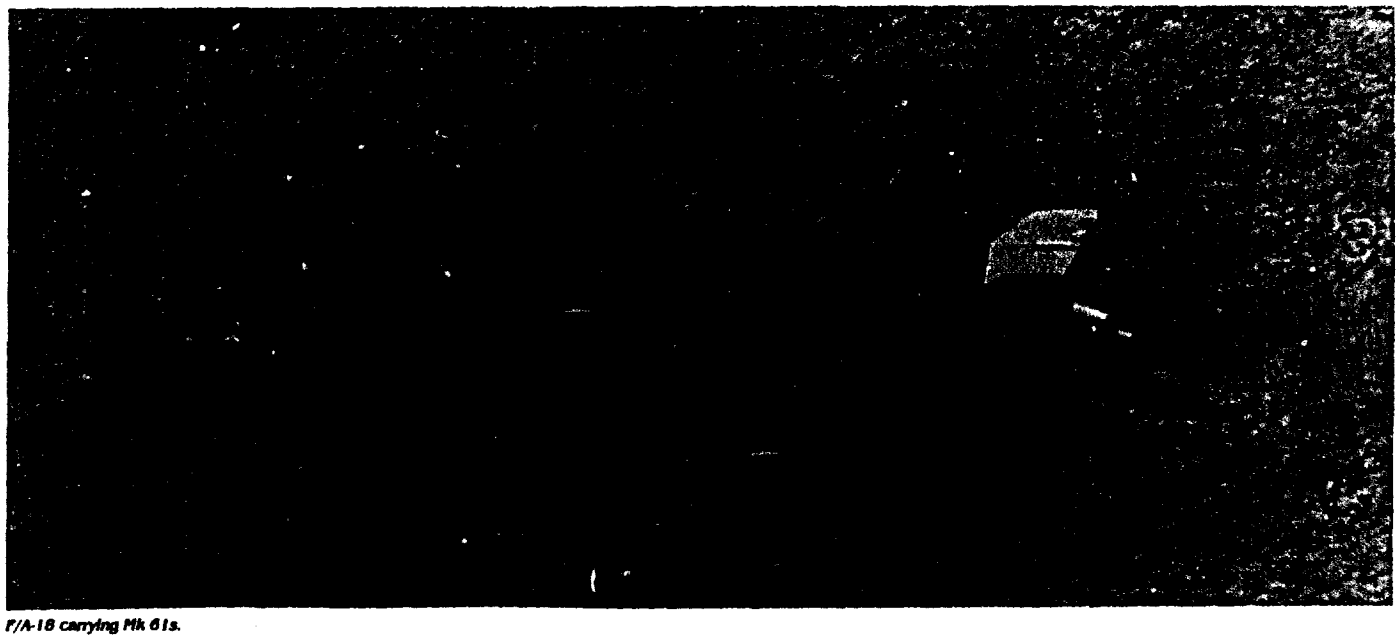
Meanwhile, the Manhattan Engineering District was progressing at Los Alamos in northern New Mexico. The operation required extensive flight-test facilities; Kirtland and Sandia 60 miles to the south—a 15-minute flight—were logical choices. Several Los Alamos units relocated to Sandia Base in 1945; these units became the Sandia Corporation (later part of Sandia National Laboratories) in 1949. Although today the Sandia National Laboratories does not manufacture or assemble weapons, part of the Sandia Corporation's original mission was to perform weapons development engineering and assembly for the Manhattan Engineering District.

Kirtland Field was redesignated Kirtland Air Force Base in 1947. Both Sandia Base and Kirtland expanded rapidly throughout the 1940s and '50s as more nuclear-related facilities and laboratories were added. Not until 1971 did Sandia and Kirtland merge

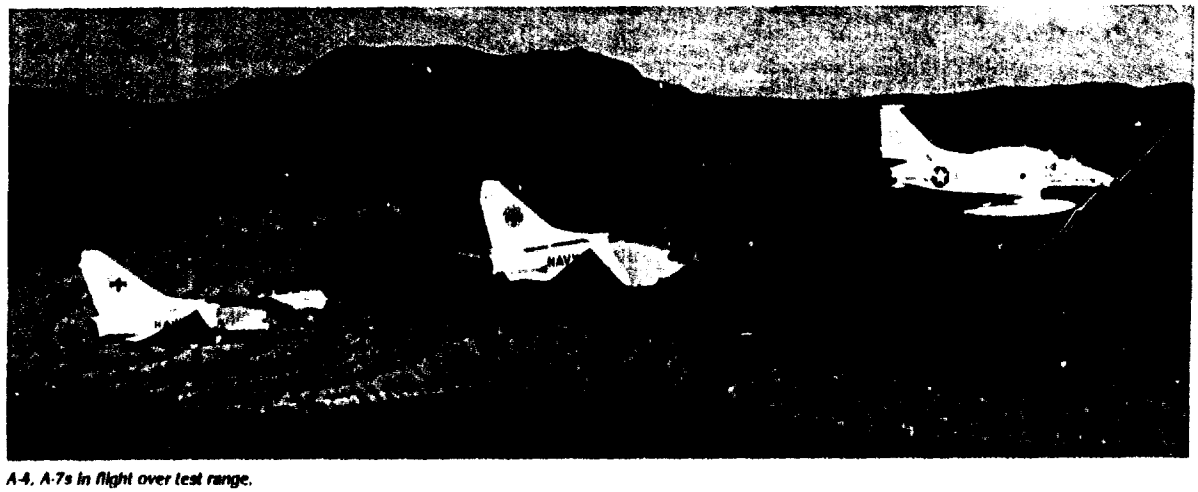
F-14 EMP testing.

into one base under Air Force control, with Sandia National Laboratories as the base's largest tenant.

As part of this extensive nuclear community in New Mexico, NWEF made use of a host of non-Navy-owned ranges and facilities. The Tonopah Range in central Nevada, operated by Sandia for the Atomic Energy Commission, was especially suited for studies of high-speed aircraft and ballistic-vehicle trajectory. A unique hard-target complex—over 400,000 square feet of concrete able to withstand 4,000-pounds-per-square-inch impacts—provided the means to analyze impact phenomena. The Army's White Sands Missile Range (WSMR) in New Mexico, a national range, provided electronic instrumentation for optical and three-dimensional



F/A-18 carrying Mk 61s.

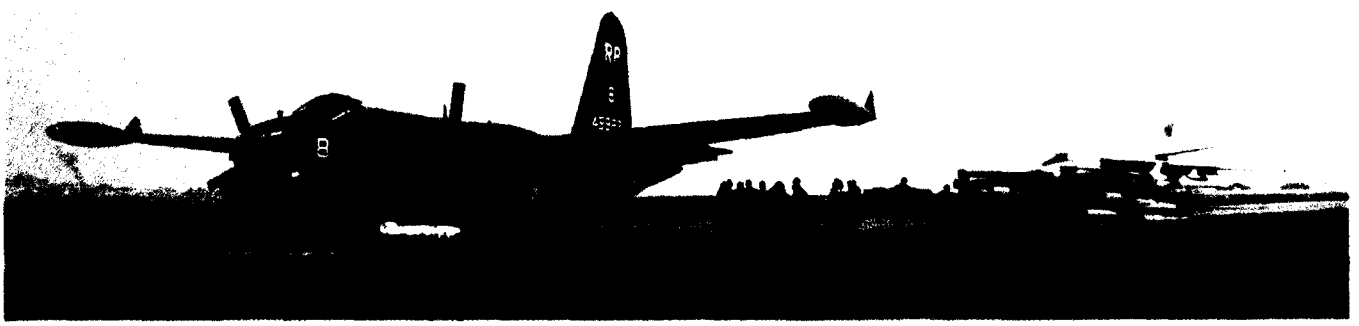


A-4, A-7s in flight over test range.

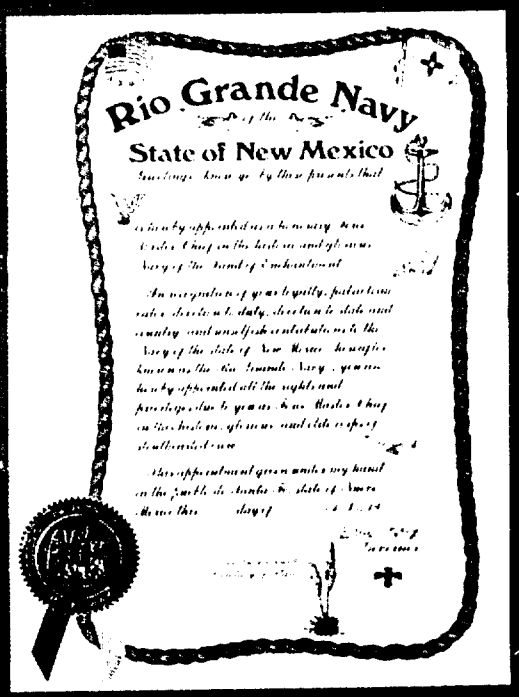
monitoring of flight tests of air-launched weapons. WSMR also offered methods for rapid retrieval of ordnance from the impact site—an important consideration for the sensitive weapons used in many of NWEF's tests. Another resource for testing was the Air Force Special Weapons Center (AFSWC) at Kirtland Air Force Base. AFSWC's specialized laboratories and weapons-effects and environment facilities included computer facilities, the Transient Radiation Effects on Electronics Test Facility, environmental and dynamic- and static-test laboratories, an electromagnetic pulse (EMP) test facility, and an EMP simulator. For flight tests, NWEF occasionally used the Salton Sea, El Centro, and China Lake ranges in California and the uninstrumented Melrose and Red River range facilities, where NWEF provided aircraft and flight-crew support on site.

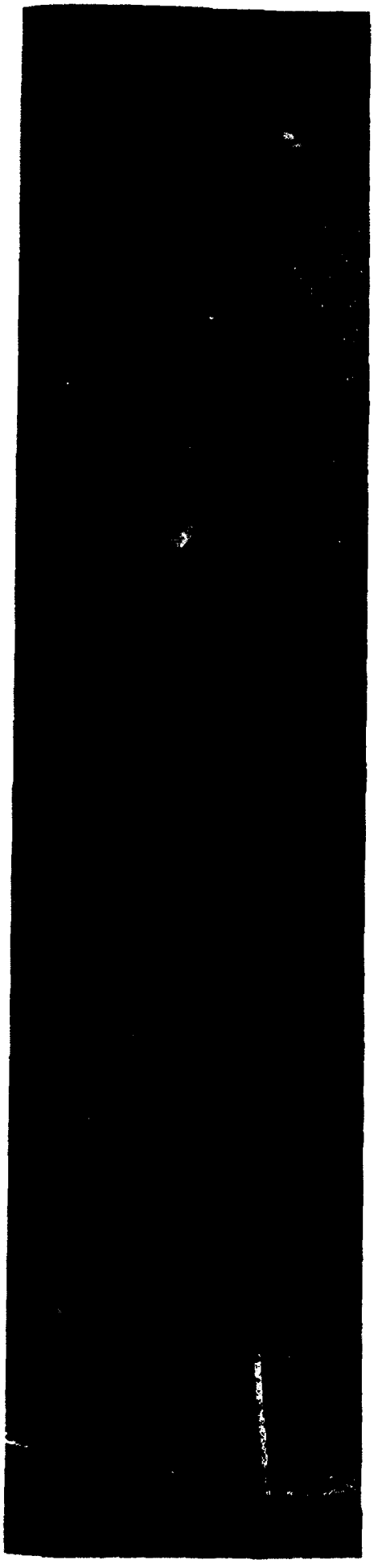
C-54P, NA-3A, A-7A, TF-9J flyover, 1970.

F/A-18 special test setup.



P2V-7 and A3D being loaded with special weapons for drop test.

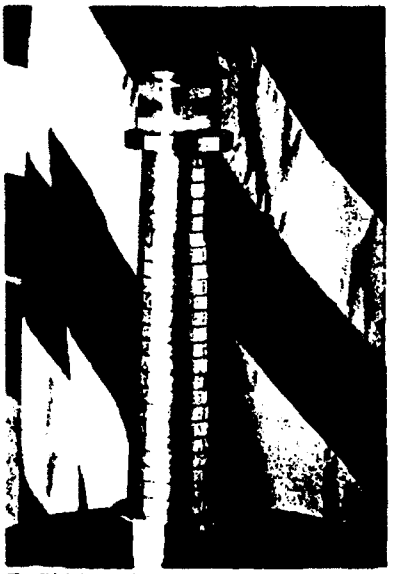

Rio Grande Navy
of the
State of New Mexico



Traditions That Will Be Remembered . . .

Not all NWEF's innovations were of a technical nature. One of NWEF's proudest achievements is the Navy Balloon Team. In 1976, to aid the national naval recruiting effort, NWEF proposed the concept of the Navy hot-air balloon and hot-air-balloon team. Working with the Navy Recruiting Command in Washington, D.C., NWEF personnel designed a colorful recruiting "billboard," a red, white, and blue balloon featuring the Navy logo and the words "Navy, An Adventure." Some precedent for this idea existed at NWEF: in July 1975, ADJ2 Eric Peterson had elected to reenlist in a hot-air balloon, receiving his air-crewman wings in an airborne ceremony. The balloon-team idea caught on quickly, and at its height the Navy Hot Air Balloon Team had three balloons and more than 20 volunteer crew members who traveled with the team while continuing to perform their regularly assigned duties. A Navy Hot Air Balloon Team Detachment was constituted under the Naval Recruiting District, Albuquerque, in January 1993 to continue recruiting support. Thousands of people throughout the United States continue to enjoy the spectacle of the Navy's hot-air balloons at air shows and other public gatherings throughout the year.

In this small, close-knit Navy community—rarely did NWEF have more than a few hundred naval and civilian personnel at one time—maintaining a Navy identity involved some traditions unique to NWEF. Don Sines, whose association with NWEF spans some 40 years as a Navy man, contractor representative, and NWEF employee, remembers one of the ways the Facility never let it be forgotten that it was part and parcel of the U.S. Navy and an integral part of the Navy's air arm. In the same tradition as the "FLY NAVY" sign on the NWEF hangar, NWEF pilots would paint "FLY NAVY" on the bottoms of the wings of their airplanes. "I first saw it in the early 1950s, on the F-7Us and such—the ones with the folding wings," said Sines. The message showed clearly when the planes were lined



The "Lighthouse."

Bernice Chase at NWEF, 1993.

Quarterdeck display.

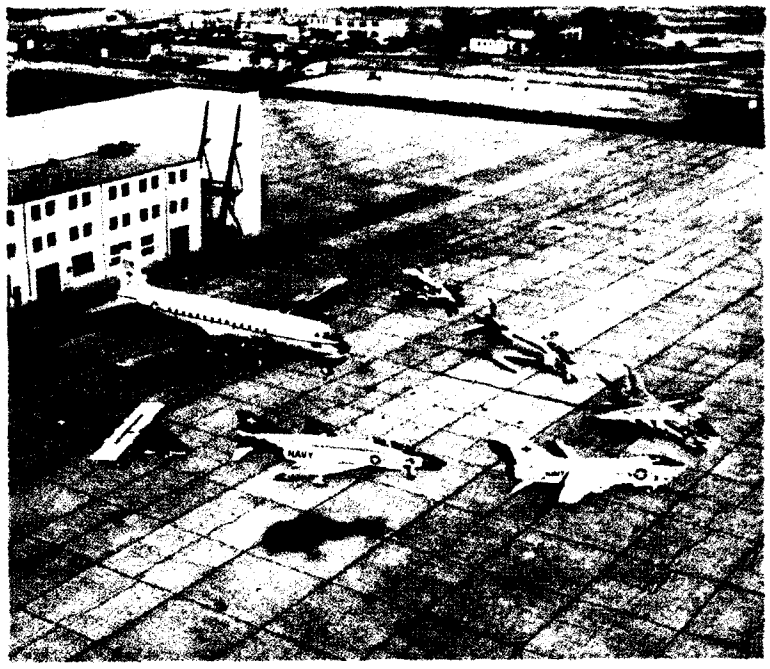
up—"Even on Air Force bases they'd put that message out. Always part of it—very proud to be part of the Navy."

Another tradition was the "Lighthouse"—a distinctly naval and seafaring symbol to be found on a desert Air Force base. The Lighthouse model was made by one of the Facility's first employees, an engineer named Hamp Richardson; the employee with the longest tenure at the Facility kept the Lighthouse until retiring or moving on, at which time the Lighthouse passed to the next employee. "I always said that I wanted to leave before I got the Lighthouse, but now that I have it I'm proud to be the owner," said Bernice Chase, a 40-year federal employee. Chase worked at NWEF for more than 30 years and is the Lighthouse's last keeper.

In 1993 NWEF was decommissioned, the first nuclear-weapons-related facility in the Free World to be shut down. As NWEF closed, it transferred some of its people and functions to the China Lake site of the Naval Air Warfare Center Weapons Division, formerly NOTS China Lake, from which some of NWEF's original civilian complement had come, thus bringing a part of NWEF's history full-circle.

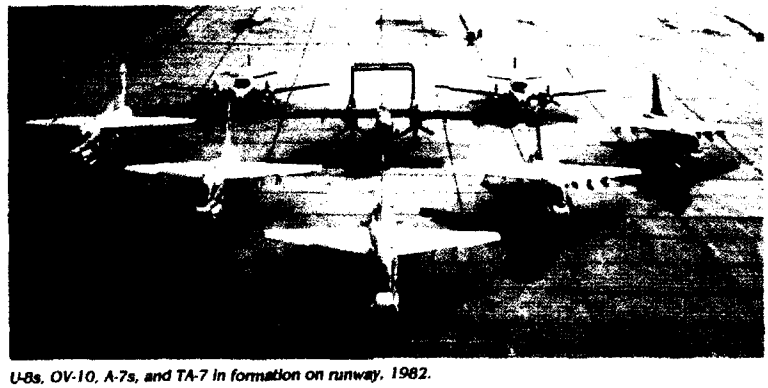
Since 1949 the Navy's presence at Albuquerque played a critical part in handling the awesome responsibility that goes with a nuclear-armed Navy. The organization, though always small in size, rigorously ensured the safety and effectiveness of Navy nuclear weapons throughout the Cold War. With a combination of officer and enlisted personnel, Navy civilian staff, and Navy support contractors, NWEF maintained a tradition of teamwork and dedication to a mission popularly deemed unpopular for so long. Long-time NWEF employee Craig Oswald, reflecting on the closing of NWEF and on its role in the Nation's strategic deterrence, said NWEF needs to be remembered for maintaining a viable naval nuclear force. "I'm very proud that I've worked for over 25 years in nuclear safety and the design of these weapons to deter a world war, and it has worked."

Now, as the complexion of modern Navy warfare changes, the job of these dedicated and highly trained people is completed; deterrence was accomplished. If, indeed, the need has subsided for active deterrence, then it is only natural that the nuclear establishment will wither away. But the role that NWEF played has historic significance for the Navy and the post-World War II era.



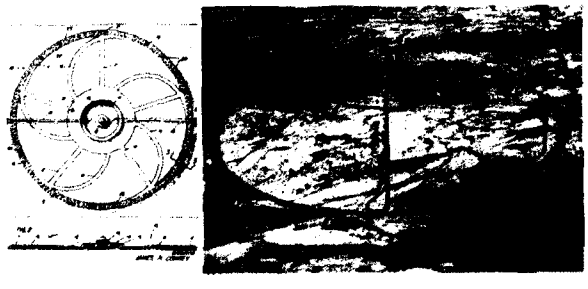
A-7s, F-4s, TA-4, OV-10, and C-118, circa 1974.

NASWF YA3D-1, 1957.



U-8s, OV-10, A-7s, and TA-7 in formation on runway, 1982.

An interesting aside in NWEF's history is the Circular Runway Project. During 1961, LT J. R. Conrey, a young naval aviator assigned to NWEF, worked out an innovative solution to the difficulties of cross-wind landings: a spoked circular runway, which he submitted for patent in November. NWEF tested the concept using the General Motors test track at Mesa, Arizona, as a proving ground. The concept was tested with a wide variety of aircraft during 1964 and 1965, including the A-4, A-1, and C-54, before being abandoned.



Commanding Officers

CDR
T. J. Walker
(Officer-in-Charge)
1949-52

CDR
F. H. Michaelis
1952-54

CDR
J. H. Rockwell, Jr.
1954

CAPT
S. A. Venevery
1954-55

CAPT
G. Marcus
1955-57

CDR
G. S. Morrison
1957

CAPT
A. I. Boyd, Jr.
1957-60

CAPT
R. C. Barnes
1960

CAPT
D. G. Adams
1960-62

CAPT
K. H. Morris
1962-64

CDR
A. Thomas
1964

CAPT
K. F. Rowell
1964-65

CAPT
R. W. Jackson
1965-66

CAPT
D. C. Stanley
1966-69

CAPT
W. W. Strong
1969-71

CAPT
R. H. Stolpe
1971-74

CAPT
R. H. Caldwell
1974-77

CAPT
J. J. Lahr
1977-79

CAPT
D. R. Weichman
1979-82

CAPT
R. C. Kaup
1982-85

CAPT
J. E. Killian
1985-87

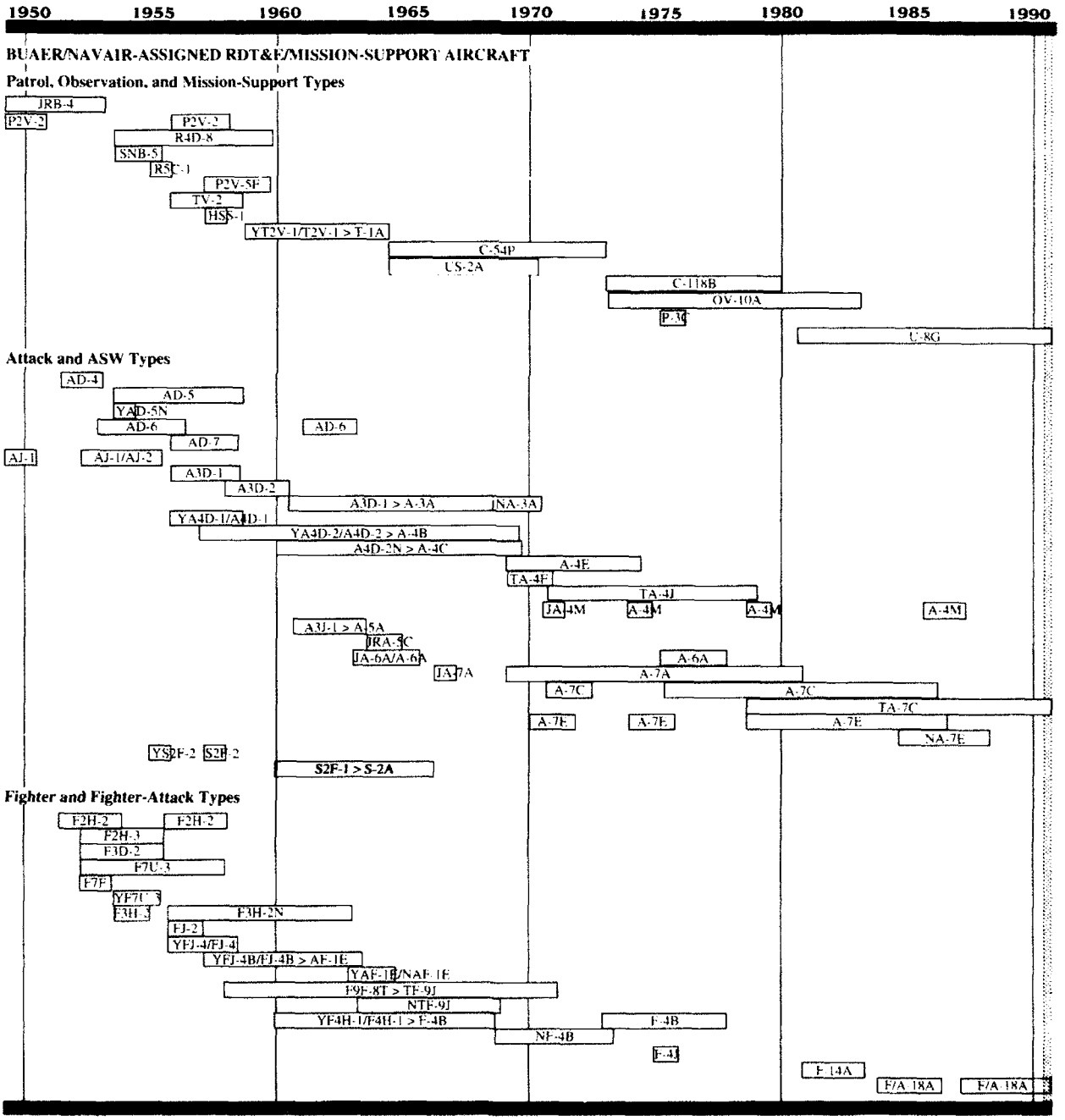
CAPT
L. Farr
1987-90

CAPT
R. K. Hull
1990-93

Aircraft Assigned to NWEF

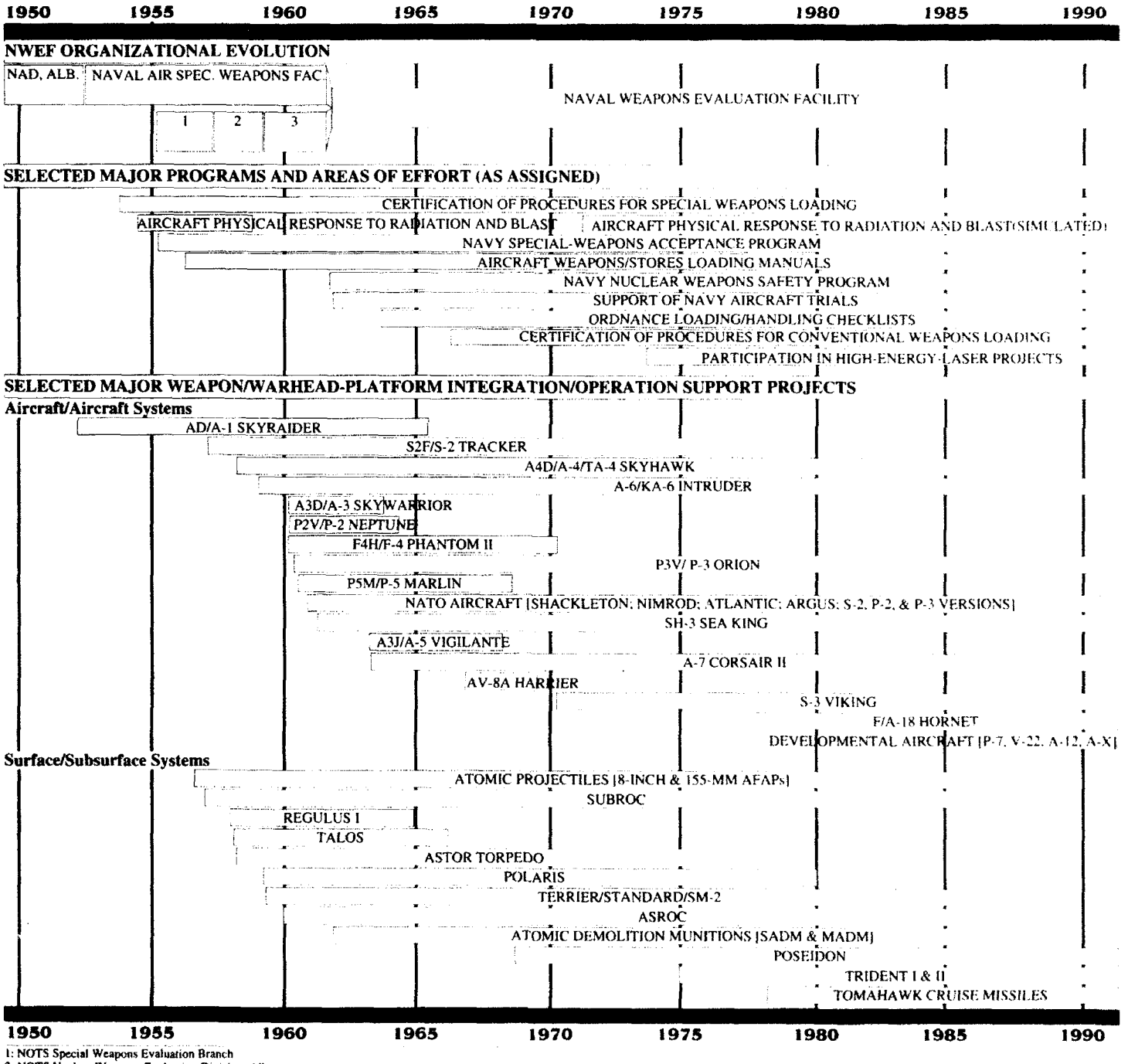
NWEF's mission was first and foremost as an aviation activity; although support for surface and subsurface weapon systems came to comprise a siginifcant portion of NWEF's workload—and its contributions to the Fleet—aircraft remained in the forefront. Over its 40+ years of supporting the operation of all Navy special-weapon-capable aircraft, the Naval Weapons Evaluation Facility and its precursors saw the assignment of a wide variety of aerial platforms (including the occasional hot-air balloon).

Along with its assigned aircraft, NWEF played host to a significant number of "transients"—from multiengine cargo planes and various helicopters to British Shackletons and Nimrods. Over the years, NWEF has had a relationship with nearly any- and every- Navy thing special-weapon assignable (operation, transportation, and support) in the air, on the surface, and under the sea.



For over four decades NWEF supported the integration and operation of nuclear bombs, rockets, and depth bombs on nearly every Navy special-weapon-capable aircraft and of nuclear warheads on a wide variety of Navy tactical and strategic weapon systems deployed on any and every Navy platform.

The bottom line was the assurance of safe and efficient transportation, loading, handling, and operation of the wide variety of weapons that has formed the U.S. Navy's atomic arsenal—from the Mk 4 through Mk 91 bombs and the atomic-tipped rockets and submarine killers such as BOAR, "Betty," Hotpoint, and "Lulu," to the eclectic mix of nuclear projectiles, torpedoes, mines, and missiles that has been operated by U.S. and NATO naval forces as aspects of deterrence.



1: NOTS Special Weapons Evaluation Branch
2: NOTS Nuclear Weapons Evaluation Division, Albuquerque
3: Navy Nuclear Ordnance Evaluation Unit, Albuquerque

As the twenty-second and final commanding officer of the Naval Weapons Evaluation Facility, I have watched the culmination of a monumental effort of a group of the Navy and Marine Corps' finest technical talent. Over the 45 years since the first Navy special weapons detachment was formed here in Albuquerque, these people have met the challenge of developing and preserving the safety of the world's most destructive and politically influential weapon systems. By every measure, they have been enormously successful.

The disbanding of a team after the completion of a mission is never easy. The first response is generally, "Give us another mission!" But in this case, the decision makes sense. The Nation, and the world, are moving away from the wide proliferation of nuclear weapons. By Presidential directive and as a result of international agreement, these weapons have been withdrawn from tactical platforms, dismantled or stored, and reduced dramatically in number; for all practical purposes they have lost favor in the expenditure of R&D dollars.

The functions for which NWEF has so admirably served are now largely obsolete, and, therefore, the reason for its existence as a command is no longer valid. Disestablishment is the right and proper course of action.

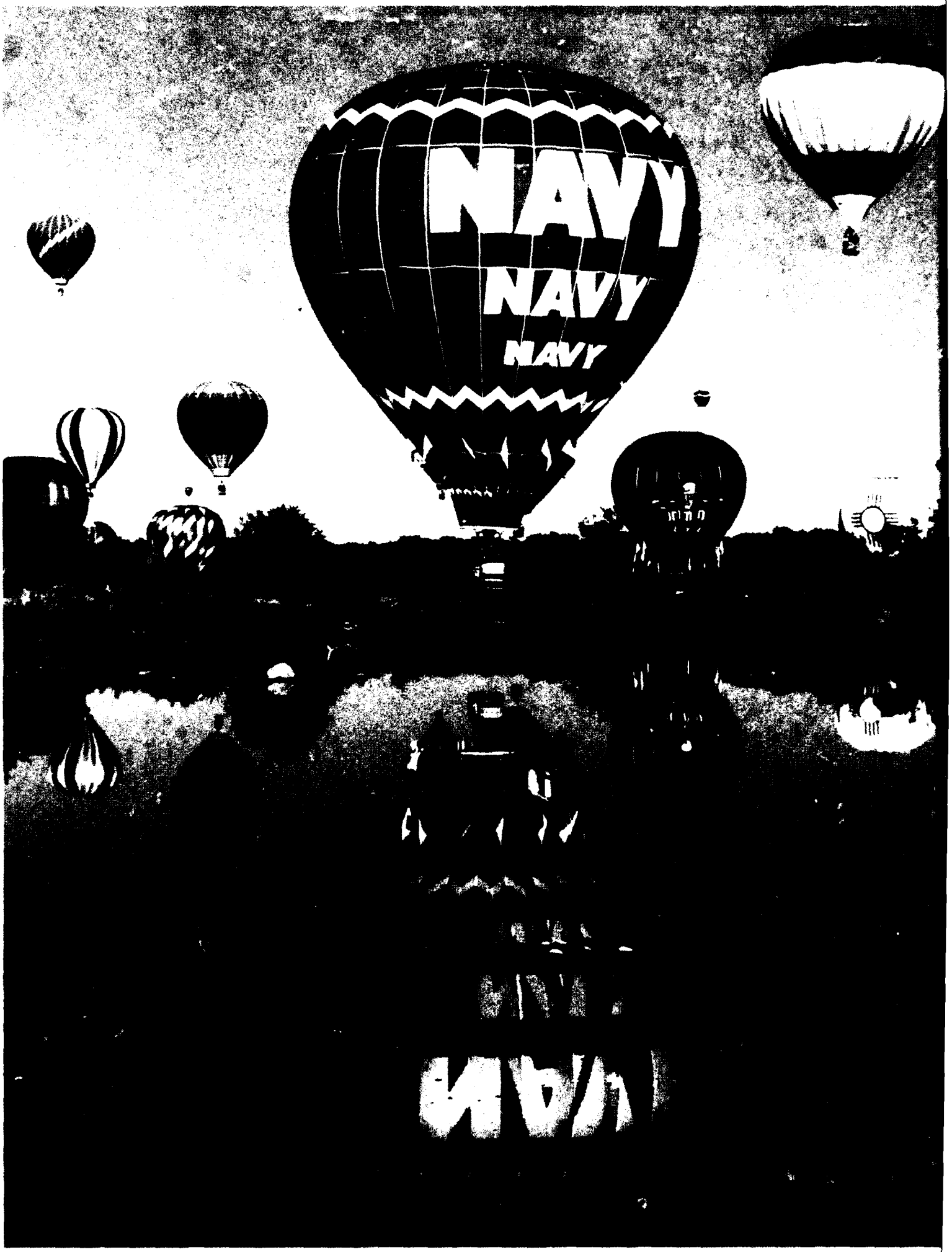
Every former member of the NWEF team can justifiably stand with pride and say, "This is what I have done for my country. I have made a real contribution to the readiness for war, and to the preservation of peace," knowing that if we had failed in this mission, the consequences might have been unimaginable.

NWEF has flown virtually every aircraft type the Navy has owned, and has worked with every nuclear-weapon system, whether air-, surface-, subsurface-, or land-launched. The pace has, at times, been frenetic, particularly from the late '50s through the early '70s. Projects have ranged from the simple to the bizarre—and some only distantly related to nuclear-weapons safety.

But virtually all the sailors, Marines, and civilians who have worked here have "gotten sand in their shoes." Albuquerque is a place that grows on you.

Long after the disestablishment, the fly-off of the last aircraft, and the departure of most of our people for other jobs, the memories of NWEF as a command that made a difference in the history of the Navy and the Nation will endure. The detachment that stays in New Mexico to conduct the remaining strategic nuclear safety business will have 45 years of service as its legacy.

— CAPT Roger K. Hull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