Engineers without Borders:
A History
of the
U.S. Army Engineering and Support Center
Huntsville

1967-2017

By

Damon Manders

August 2017

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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE
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REPLY TO
ATTENTION OF

Foreword

To the Members and Friends of the Huntsville Center:

The U.S. Army Corps of Engineers Engineering and Support Center, Huntsville celebrated its 50th Anniversary in October 2017. In the following pages, the reader can enjoy the many accomplishments of this great organization. The hundreds of dedicated individuals who work here each day directly impact the lives of Soldiers, Sailors, Airmen, Marines and other U.S. government personnel. Projects supervised, directed, led or initiated at the Huntsville Center have enhanced quality of life and combat readiness around the globe.

The Huntsville Center started in 1967 as the Huntsville District. Its roots lay in Ballistic Missile Defense during the height of the Cold War. It quickly branched out to other areas to include procurement, contracting, project management and technical engineering solutions. As the Center's mission grew, so did its reputation. During the 1980s, the chemical weapons demilitarization started under the auspices of the Huntsville Center. It continues to this day within the U.S. and Russia. Another interesting fact about Huntsville Center is that the Center was among the first to conduct business on the World Wide Web; in January 1996 it announced a $100 million project on the internet.

The 21st Century has brought new challenges to the Huntsville Center. It continues to support the warfighter by acting as a center of expertise for multiple programs such as the Medical Center of Expertise and Environmental and Munitions Mandatory Center of Expertise. The Center is also responsible for multiple energy programs, access control points for federal installations, support to the Global War on Terror and support to multiple natural disasters such as Hurricanes Katrina, Ike, Irma and Maria.

The Huntsville Center has proven that its employees are the best in the U.S. Army Corps of Engineers through its dedicated support. Around the globe, the Center has proven that it is second to none. The next 50 years prove to be just as exciting and laudable! Building Strong!

Sincerely,

John S. Hurley

JOHN S. HURLEY
Colonel, US Army
Commander

Essayons! Building Strong

About the Author

Damon Manders is a contract historian employed through the U.S. Army Corps of Engineers, St. Louis District. He first began work for the Corps in completing *A History of the Huntsville Division, U.S. Army Corps of Engineers, 1988-1992* and *History of the U.S. Army Corps of Engineers, Engineering and Support Center, Huntsville, 1993-1997*. He is the author or coauthor of *Rebuilding Hope: Task Force Hope and the U.S. Army Corps of Engineers, Mississippi River Division Response to Hurricanes Katrina and Rita; Improving the Common Stock of Knowledge: Research and Development in the U.S. Army Corps of Engineers*; and *Engineers Far From Ordinary: The U.S. Army Corps of Engineers in St. Louis.* More recently, he has completed unpublished manuscripts for the U.S. Army Corps of Engineers Office of History on disaster relief. He also serves as an officer in the Alabama Army National Guard, in which he had supported relief efforts for Hurricane Katrina in 2005 and the tornado outbreak of 2011 and served in Operation Iraqi Freedom and Operation Enduring Freedom. After graduating magna cum laude from the University of North Alabama with degrees in English, history, and political science, he earned his master's degree in history from the University of Mississippi in 1995. He is married with two children.

Author's Preface and Acknowledgements

When the U.S. Army Engineering and Support Center, Huntsville, began looking for a historian to write its 50th anniversary history, the Public Affairs Office looked for someone already familiar with the organization who had historical experience.

My first projects as a contracted historian for the U.S. Army Corps of Engineers were to complete historical updates for the center from 1988-1992 and 1993-1998.

I therefore understood the historical background of the center very well and knew its focus on quality and customer service and its national mission as a technical center for the Corps. Aside from any time-savings this background provided by shortening the research time required, I believed I had the right perspective and experience to undertake such an endeavor.

As a native of Huntsville for my childhood and most of my adult life, I also understood the context in which the Huntsville Center originated – national missile defense and space technology. Fortunately, my work on other Corps historical projects permitted my involvement. I am proud to present the following 50-year history of the Huntsville Center as a result of these efforts.

For those not familiar with the Huntsville Center, it is unique among Corps of Engineers entities.

Although once a division, it never had a geographic mission, as most Corps districts and divisions have. Its focus has always been on projects and programs with a national scope that are highly technical or that require centralized management to be efficient.

While its mission set is more fluid than most Corps districts or divisions, it has consistently focused on four broad areas: environmental cleanup, ordnance removal, and chemical warfare materiel removal; installation support, facilities repair and maintenance, medical facilities, and facilities acquisition; energy conservation, reduction, and contracting; and systems engineering and construction for ballistic missile defense, munitions production, and chemical demilitarization.

As a result of this specialized focus, the Headquarters of the U.S. Army Corps of Engineers (HQUSACE) has recognized Huntsville as a center of expertise in more than 20 areas throughout its history. The center has repeatedly proved itself as an innovator – in specialized technology, in the use of computers, in new contracting vehicles, and in process improvement.

By pioneering these capabilities, it has served as a testing ground for new programs, many of which eventually became the responsibilities of Corps districts. Environmental mitigation is perhaps the most prominent example.

When the Corps first began responding to the environmental laws of the 1970s, HQUSACE relied on the Huntsville Center to introduce and manage the requirements.

Within a decade, the districts assumed responsibility for environmental projects even though the center remained responsible for those programs that required increased oversight to maintain safety levels.

Thus, although sometimes criticized as their competitor, in fact, the center's role has always been to support the districts with new areas, create greater efficiencies, or provide technical advice. This was part of the reason that HQUSACE adopted the designation of Engineering and Support Center in 1995.

It is unclear what future missions the center might manage, but one can be sure that it will continue to support the districts and the Corps with the newest technologies and best practices.

Writing a 50-year history of the Huntsville Center has presented several challenges. There are very few original records available. These include, primarily, two boxes at the National Archives in Atlanta, two boxes at the Federal Records Center in Atlanta, and about two boxes worth of digital records from the U.S. Army Space and Missile Defense Command on Redstone Arsenal, Alabama.

Most of these records, however, concentrate on the period prior to 1975. Other records that may have been available were not easy to locate or obtain. Because of the disappearance of some records, I've had to rely on notes from the author of the first history – James Kitchens – for the contents of some interviews or reports. I've treated these notes as primary sources and have so notated them in the footnotes.

For the period from 1975 to 1995, I have relied primarily on secondary sources supplemented by government reports and a handful of fact sheets or memos. There are fairly detailed histories by James Kitchens, Louise S. Heidish, Louis Torres, and Damon Manders covering this time period. I was able to obtain some of the original tasking memos for centers of expertise or other missions.

After 1995, I relied primarily on the Huntsville Center Bulletin and secondary sources, supplemented by interviews, websites, and other government reports available, as well as the history by Patricia Stallings and Edward Salo.

Readers should also note that for the last decade, there was no history available, so the notes for this section are longer and more detailed. Due to the breadth of the Huntsville center missions, it has been difficult to do more than provide a rough background for its many programs, usually based on available secondary sources.

Since the Huntsville Center does not have a physical library,

I obtained most secondary sources through public sources. I supplemented this information with some historical interviews, but unfortunately the task order, scope of the project, and timeframe required did not allow for interviews of all former and current commanders and managers.

Despite these challenges, I was able to develop a fairly detailed though brief narrative of the center's activities sufficient for a history covering five decades.

On a project this size, many individuals deserve recognition and thanks.

I am particularly grateful for the assistance, research support, review coordination, and helpful comments provided by the Huntsville Center Public Affairs Office, and particularly Debra Valine, Julia Bobick, and Scott Farrow. David San Miguel provided excellent editing support, which helped to greatly improve the manuscript.

The Corps of Engineers History Office, and particularly Matt Pearcy, provided support for my completing this project.

I thank the many employees who agreed to historical interviews, including David Douthat, Steve Willoughby, Wilson Walters, Pat Haas, Paul Robinson, Bill Craven, Bruce Railly, Bruce Whisenant, Jim Manthey, Sandy Zebrowski, John Matthews, Charles Ford, and retired Army colonels Nello L. Tortora and Robert J. Ruch.

I also want to extend my appreciation to Mike May for recording the interviews, and Scott Farrow for transcribing portions of them for the manuscript.

Most of all, I want to thank God for the opportunity to work on this project.

Damon Manders
February 2017

Acronym List

AAP	**Army Ammunition Plant**
ABMs	**Anti-Ballistic Missiles**
ABMA	**U.S. Army Ballistic Missile Agency**
ACE-IT	**U.S. Army Corps of Engineers-Information Technology**
ACOE	**Army Communities of Excellence**
ACP	**Access Control Point**
ACPP	**Access Control Point Program**
ACPEP	**Access Control Point Equipment Program**
ACTS	**Army Criteria Tracking System**
ACWA	**Assembled Chemical Weapons Alternatives**
AEC	**U.S. Army Environmental Command**
AFCS	**Army Facilities Components System**
AFB	**Air Force Base**
AFIP	**Armed Forces Institute of Pathology**
AIE	**Automated Installation Entry**
AMC	**U.S. Army Materiel Command**
AMCOM	**U.S. Army Aviation and Missile Command**
AMP	**Army Metering Program**
APAP	**Army Pollution Abatement Program**
APIC	**Army Performance Improvement Criteria**
ARCOM	**U.S. Army Armaments Materiel Readiness Command**
ARGMA	**Army Rocket and Guided Missile Agency**
ARMP	**Army Range Modernization Program**
ARRA	**American Reinvestment and Recovery Act**
ASCIM	**Assistant Chief of Staff for Installation Management**
ASP	**Ammunition Supply Point**
ASR	**Archive Search Reports**
BIM	**Building Information Management**
BLAST	**Building Loan Analysis and Systems Thermodynamics**
BMD	**Ballistic Missile Defense System**
BMDATC	**BMD Advanced Technology Center**
BMDO	**Ballistic Missile Defense Organization**
BMEWS	**Ballistic Missile Early Warning System**
BOCC	**Building Operation Command Center**
BRAC	**Base Realignment and Closure**
BTU	**British Thermal Unit**
CACES	**Computer-Aided Cost Estimating System**
CAD	**Computer-Aided Design**
CAEADS	**Computer-Aided Engineering and Architectural Design Systems**
CAL	**Chemical Weapons Destruction Central Analytical Laboratory**
CAMDS	**Chemical Agent Munitions Disposal System**
CEA	**Captured Enemy Ammunition**
CEFMS	**Corps of Engineers Financial Management System**
CENTCOM	**U.S. Army Central Command**
CERCLA	**Comprehensive Environmental Response and Compensation Liability Act**
CERL	**Construction and Engineering Laboratory**
CEUP	**Computer Evaluation of Utility Plans**
CFSC	**Community and Family Support Center**
CHESS	**Computer Hardware and Enterprise Software Solutions**
CICCONAD	**Commander-in-Chief Continental Air Defense Command**
CJTF-7	**Combined Joint Task Force-7**
CMA	**Centrally Managed Administrative**
CMA	**Chemical Materials Agency**

CMC	**Coalition Munitions Clearance**
CMR	**Command Management Review**
CONTRAST	**Corps of Engineers Nontraditional Systems Training**
CONUS	**Continental United States**
COS	**Centers of Standardization**
CPAC	**Civilian Personnel Assistance Center**
CPI	**Continuous Process Improvement**
CPW	**Center for Public Works**
CSDP	**Chemical Stockpile Disposal Program**
CSI	**Customer Satisfaction Index**
CT	**Computed Tomography**
CTR	**Cooperative Threat Reduction**
CTT	**Close, Transferred, and Transferring**
CUP	**Commercial Utilities Program**
CW	**Chemical Weapon**
CWC	**Chemical Weapons Convention**
CWM	**Chemical Warfare Materiel**
CX	**Center of Expertise**
DA	**Department of the Army**
DAART	**Directorate of Army Ammunition, Ranges, and Targets**
DAMRIP	**Department of the Army Management Review and Improvement Program**
DARCOM	**Development and Readiness Command**
DERP	**Defense Environmental Restoration Program**
DGP	**Digital Geophysical Mapping**
DLA	**Defense Logistics Agency**
DMM	**Discarded Military Munitions**
DNA	**Defense Nuclear Agency**
DOD	**Department of Defense**
DOE	**Department of Energy**
DPW	**Directorates of Public Works**
DRI	**Defense Reform Initiative**
DRID	**Defense Reform Initiative Directive**
DSMOA	**Defense State Memorandum of Agreement Program**
DRMS	**Defense Reutilization and Marketing Service**
DTRA	**Defense Threat Reduction Agency**
DUMP	**Division Urgent Moving Project**
EARLI	**Evaluation and Assessment of Regulatory and Legislative Impacts**
ECBC	**Edgewood Chemical Biological Center**
EDS	**Electrodynamic Suspension**
EEAP	**Energy Engineering and Analysis Program**
EEO	**Equal Employment Opportunity**
EE/CA	**Engineering Evaluation/Cost Analysis**
EIM	**Energy Information Management**
EKO	**Engineering Knowledge Online**
EMCS	**Energy Monitoring and Control Systems**
EM CX	**Environmental and Munitions Mandatory Center of Expertise**
EMAAR	**Engineer Management Automation Army Reserve**
EMS	**Electromagnetic Suspension**
EMP	**Electromagnetic Pulse**
EOD	**Explosive Ordnance Disposal**
EODT	**Explosive Ordnance Disposal Technology, Inc.**
EPA	**Environmental Protection Agency**
EPA 2005	**Energy Policy Act of 2005**
ERDA	**Energy Research and Development Administration**
ERDC	**Engineer Research and Development Center**
ERIS	**Exoatmospheric Reentry Interceptor Subsystem**
ESCA	**Environmental Services Cooperative Agreements**

ESPC	**Energy Savings Performance Contracting**
ESS	**Electronic Security Systems**
FEMA	**Federal Emergency Management Agency**
FESA	**Facilities Engineering Support Agency**
FORSCOM	**U.S. Army Forces Command**
FRP	**Facilities Reduction Program**
FRR	**Facilities Repair and Renewal**
FUDS	**Formerly Used Defense Sites**
FUSRAP	**Formerly Utilized Sites Remedial Action Program**
FY	**Fiscal Year**
G-3	**Division and Corps Level Operations Staff**
G&A	**General and Administrative**
GAO	**General Accounting Office / Government Accountability Office**
GB	**NATO designation for Sarin Nerve Gas**
GBFEL-TIE	**Ground-Based Free Electron Laser-Technology Integrated Experiment**
GBI	**Ground Based Interceptor**
GBR-P	**Ground Based Radar-Prototype**
GBR-T	**Ground Based Radar-Test**
GEN-IT	**General-Information Technology**
GEP	**Ground Based Entry Point**
GFP	**Government Furnished Property**
GIS	**Geographic Information System**
GS	**Grade Structure**
GSA	**General Services Administration**
GWOT	**Global War on Terror**
HEDI	**High Endoatmospheric Defense Interceptor**
HEMP	**High-Altitude Electromagnetic Pulse**
HFO	**Health Facilities Officer**
HMX	**High Melting Explosive; a Conventional High Explosive**
HNC	**U.S. Army Corps of Engineers, Engineering and Support Center, Huntsville**
HPC-IT	**High Performance Computing-Information Technology**
HQDA	**Headquarters, Department of the Army**
HQUSACE	**Headquarters, U.S. Army Corps of Engineers**
HTML	**Hypertext Markup Language**
HTRW	**Hazardous, Toxic, and Radioactive Waste**
HVAC	**Heating, Ventilating, and Air Conditioning**
ICBMs	**Intercontinental Ballistic Missiles**
IDBB	**Integrated Design/Bid/Build**
IDIQ	**Indefinite-Delivery, Indefinite-Quantity**
IDS	**Intrusion Detection System**
IED	**Improvised Explosive Device**
IMA	**Installation Management Agency**
IMCOM	**U.S. Army Installation Management Command**
IMMSS	**Integrated Modular Medical Support Systems**
IO&T	**Initial Outfitting and Transition**
IRP	**Installation Restoration Program**
IS CX	**Installation Support Center of Expertise**
ISIL	**Islamic State of Iraq and the Levant**
ISO	**International Standards Organization**
ISTEA	**Intermodal Surface Transportation Efficiency Act**
IT	**Information Technology**
ITS	**IT Services Office**
JACADS	**Johnston Atoll Chemical Agent Disposal System**
JBLM	**Joint Base Lewis-McChord, Washington**

JMD-A	**Joint Munitions Disposal-Afghanistan**
KERO	**Kuwait Emergency Recovery Office**
KITE	**Kinetic Kill Vehicle Integrated Technology Experiment**
KKV	**Kinetic Kill Vehicle**
LAN	**Local Area Network**
LoAD	**Low Altitude Defense**
LCPM	**Life Cycle Project Manager**
"M" Design	**Mobilization Design**
MACES	**Microcomputer-Aided Cost Estimation System**
MAD	**Mutually Assured Destruction**
MAGLEV	**Magnetically Levitated**
MATOC	**Multiple Award Task Order Contract**
M2S2	**Military Munitions Support Services**
MSC	**Major Subordinate Command**
MDA	**Missile Defense Agency**
MSR	**Missile Site Radar**
MCX	**Mandatory Center of Expertise**
MCX-OE	**Mandatory Center of Expertise for Ordnance and Explosives**
MEC	**Military and Explosives of Concern**
MEDCOM	**U.S. Army Medical Command**
MED-IT	**Medical-Information Technology**
MESH	**Mapping Explosive Safety Hazards**
MFDO	**Medical Facilities Design Office**
MFMCES	**Medical Facilities Mandatory Center of Expertise and Standardization**
MICOM	**U.S. Army Missile Command**
MILCON	**Military Construction**
MIRV	**Multiple Independently Targetable Reentry Vehicles**
MOU	**Memorandum of Understanding**
MOUT	**Military Operations in Urban Terrain**
MPBSCP	**Munitions Productions Base Support Construction Program**
MM CX	**Military Munitions Center of Expertise**
MMRP	**Military Munitions Response Program**
MOUT	**Military Operations in Urban Terrain**
MRI	**Magnetic Resonance Imaging**
MRR	**Medical Repair and Renewal**
MSC	**Missile Site Control**
MX	**Missile Experimental / Medical Center of Expertise**
NASA	**National Aeronautics and Space Administration**
NAVFAC	**U.S. Navy Naval Facilities Command**
NCSA	**National Center for Supercomputing Applications**
NEPA	**National Environmental Policy Act**
NMD	**National Missile Defense**
NMI	**National MAGLEV Initiative**
NORAD	**North American Aerospace Defense Command**
NRC	**National Research Council**
NSPD	**National Security Policy Directive**
OACSIM	**Office of the Assistant Chief of Staff for Installation Management**
OCE	**Office of the Chief of Engineers**
OE	**Ordnance and Explosives**
OEF	**Operation ENDURING FREEDOM (Afghanistan)**
OEI	**Office of Energy Initiatives**
OEW	**Ordnance and Explosive Waste**
OIF	**Operation IRAQI FREEDOM**
OMB	**Office of Management and Budget**

OMEE	**Operations and Maintenance Engineering Enhancement**
O&M	**Operations and Maintenance**
OPCON	**Operational Control**
OSD	**Office of Secretary of Defense**
OSHA	**Occupational Safety and Health Administration**
PAR	**Perimeter Acquisition Radar**
PAX	**Programming, Administration, and Execution**
PC	**Personal Computer**
PMCD	**Program Manager for Chemical Demilitarization**
PDPPA	**Power Deliver Power Purchase Agreement**
PPCC	**President's Performance Contracting Challenge**
PREP	**Power Reliability Enhancement Program**
PROSPECT	**Proponent Sponsored Engineer Corps Training**
PRP	**Potentially Responsible Party**
PWTBs	**Public Works Technical Bulletins**
QP	**Quality Procedure**
RAB	**Restoration Advisory Board**
RACER	**Remedial Action Cost Engineering Requirements**
RCRA	**Resource Conservation and Recovery Act**
RCWM	**Recovered Chemical Warfare Material**
RDX	**Research Department Explosive; a Conventional High Explosive**
REM	**Resource Efficiency Manager**
REP	**Rappahannock Electric Cooperative**
RLS	**Remote Launch Site**
RMA	**Royal Military Academy [Belgian]**
RTLP	**Range and Training Land Program**
SAFSCOM	**SAFEGUARD System Command**
SALT I	**Strategic Arms Limitation Talks/ Treaty I**
SATOC	**Single Award Task Order Contract**
SBKKV	**Space-Based Kinetic Kill Vehicle**
SCWO	**Super Critical Water Oxidation**
SDC	**U.S. Army Strategic Defense Command**
SDI	**Strategic Defense Initiative**
SDIO	**Strategic Defense Initiative Organization**
SEARCH	**Systemic Evaluation and Review of Criteria for Habitability**
SENSCOM	**U.S. Army SENTINEL System Command**
SES	**Senior Executive Service**
SPAWAR	**U.S. Navy Space and Warfare Command**
SPR	**Strategic Petroleum Reserve**
SSDC	**U.S. Army Space and Strategic Defense Command**
START	**Strategic Arms Reduction Treaty**
TAC	**Transatlantic Programs Center**
TAG	**Technical Advisory Group**
TAPP	**Technical Assistance for Public Participation**
TEL	**Transporter-Erector-Launcher**
TF POWER	**Task Force Protecting our Warfighters and Electrical Resources**
TF SAFE	**Task Force Safety Actions for Fire and Electricity**
THAAD	**Terminal High Altitude Area Defense**
TM	**Technical Manual**
TMD	**Theater Missile Defense**
TQM	**Total Quality Management**
TRACE	**Training Review Committee of the Corps of Engineers**
TRACES	**Tri-Services Automated Cost Estimates System**
TRADOC	**Training and Doctrine Command**

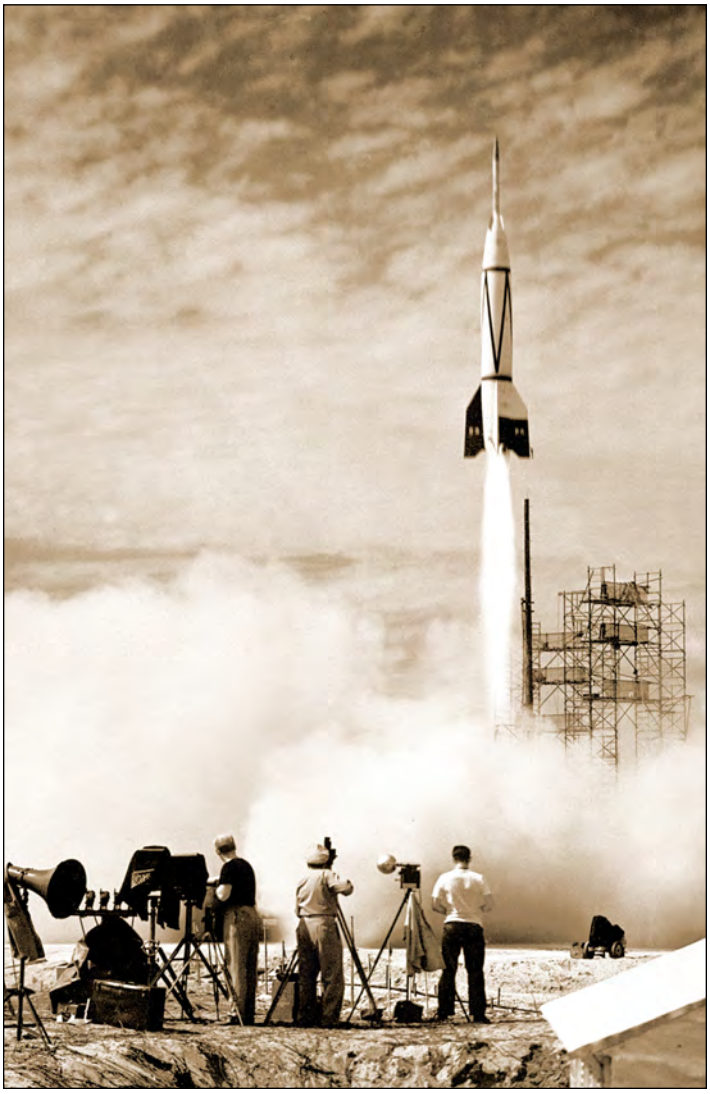
TTFW	**Tetra Tech-Foster Wheeler, Inc.**
UAH	**University of Alabama in Huntsville**
UAV	**Unmanned Aerial Vehicle**
UESC	**Utility and Energy Service Contracting**
UMCS	**Utility Monitoring and Control Systems**
UMCS-MCX	**Utility Monitoring and Control Systems Mandatory Center of Expertise**
UPH	**Unaccompanied Personnel Housing**
UPS	**Uninterrupted Power Supply**
URL	**Universal Resource Locator**
USACE	**U.S. Army Corps of Engineers**
USAE	**USA-Environmental, Inc.**
USAF	**U.S. Air Force**
USFOR-A	**U.S. Forces-Afghanistan**
USS	**Utility Systems Surveys**
USATHMA	**U.S. Army Toxic and Hazardous Materials Agency**
UXO	**Unexploded Ordnance**
VA	**U.S. Department of Veterans Affairs**
WAN	**Wide Area Network**
WES	**U.S. Waterways Experiment Station**
WI	**Work Instruction**
WTU	**Warrior Transition Unit**

1

Formation of the Huntsville Division, 1967-1972

In September 1967, the U.S. Army Corps of Engineers faced an immense challenge. Secretary of Defense Robert McNamara had just announced that the U.S. would deploy a national ballistic missile defense (BMD) program and would "begin actual production of such a system at the end of this year." The threat of a rogue or accidental launch and proliferation of nuclear weapons to hostile nations had increased greatly since China had developed nuclear technology, and there was tremendous pressure to deploy a BMD system as quickly as possible.

The Department of the Army had assigned the Corps of Engineers responsibility for construction of the system, and its Chief of Engineers, Lt. Gen. William Cassidy, needed to rapidly develop criteria, design and build technically complex structures, and procure necessary equipment at more than 20 BMD sites in 17 geographic regions. As yet, Congress had not funded the requirement, and political support for the system was uncertain. It was a tall order.



As rocket technology advanced, the threat of a rogue or accidental launch of nuclear weapons caused the U.S. to develop and deploy a ballistic missile defense program. ***(Photo courtesy of NASA)***

Just over three weeks later, the Corps of Engineers officially established an engineer division to manage the enormous project with a headquarters in Huntsville, Alabama, – the national center for missile development. It was the genesis of what would become the U.S. Army Engineering and Support Center, Huntsville.[1]

From its origin in 1967 as the Huntsville Division supporting the BMD program, the Huntsville Center demonstrated three enduring characteristics.

First, it supported national engineering missions regardless of location or Corps district. The Huntsville Division supported the BMD Systems Manager (later the SENTINEL and SAFEGUARD Systems Manager) by engineering and constructing facilities nationwide. It worked with and sometimes through other districts, but the division maintained control of the projects under the guidance of other agencies.

Second, the nature of its work was highly technical. Whether it was designing cutting-edge radar complexes, performing advanced experiments to ensure facility hardening, managing unorthodox construction contracts, or procuring highly specialized components such as high-end generators, the work of the division demanded a highly skilled and dedicated workforce.

Third, the work of the Huntsville Division was mostly reimbursable. From the beginning, this required highly cost-effective operations to control costs and provide benefit to its customers. These characteristics, which would endure into the future, originated with the Huntsville Division's initial mission of designing and building a national ballistic missile defense system.

Evolution of Ballistic Missile Defense

The U.S. BMD program had originated in the days following World War II. In fact, "the search for a defense against the missiles began on September 8, 1944, when the first German A-4 (V-2) rocket landed in a Paris suburb," argued Department of Defense analyst Benson D. Adams.

German scientists led by Wernher von Braun had developed the V-2 rocket, which German Chancellor Adolph Hitler had used to rain down terror on Britain and France during the final days of World War II. The missiles killed more than 1,000 and caused considerable destruction, but their main effect was creating fear since there was no defense against them. When von Braun and other scientists surrendered to U.S. forces in 1945 rather than being captured by the Soviet Union, the Allies used it as an opportunity to jump-start their lagging rocket development.

Under Operation PAPERCLIP, Col. Holger Toftoy relocated von Braun and more than 200 German rocket scientists to the U.S. They became the core of the new Army Ballistic Missile Agency, (ABMA), which in 1950 established its headquarters on Redstone Arsenal near Huntsville, Alabama.

The ABMA quickly developed the Redstone Rocket, the first successful U.S. missile based on the V-2. It followed this in 1957 with the Jupiter, the first intermediate range ballistic missile.

That same year, the Soviet Union made a successful test of an intercontinental ballistic missile (ICBM), and four months later the U.S. tested its first. The launching of smaller hydrogen or thermonuclear weapons from halfway around the world was now reality. Already, there was talk of a "missile gap" between U.S. and Soviet weapons as well as the need to develop a defense against them. Thus, this threat led to the development of a BMD system; the technology of which became the basis for BMD. [2]

Even as the U.S. was developing ICBMs and other missiles, it also began to develop defensive missiles. At first, the primary need was to develop weapon systems that could shoot down the supersonic aircraft developed after 1945. Anti-aircraft guns were practically useless against craft flying at speeds greater than 300 miles per hour. Under the Nike-Ajax and Nike-Hercules programs, the U.S. Army made its first successful missile intercept of a supersonic aircraft in 1951, proving the concept. It also demonstrated in 1956 that it was possible to shoot down aircraft in a mass attack. The tests had obvious applicability to protection from supersonic missiles as well.

In 1955, the Ordnance Corps contracted Bell Labs, Western Electric and Douglas to develop the Nike-II missile; in 1956, it added the requirement to develop a BMD capability.

In 1958, the Ordnance Corps created the Army Rocket and Guided Missile Agency (ARGMA) to oversee the research program, which it renamed Nike-Zeus. Although early tests were promising, the development of a BMD system proceeded much slower than an anti-aircraft system. As many noted, the technology proved more difficult, like "a bullet hitting a bullet."

Ultimately, the system included long and short-range interceptors and long and short-range radar used to track both offensive and defensive weapons. Instead of conventional radar, the system adopted computer-guided phased-array radars capable of tracking multiple targets. Later, the addition of a fast-acceleration short-range missile allowed more time to discriminate targets when needed. The first test of the system in 1960 showed more work on it was necessary.

It was not until December 14, 1961, that the Army first successfully intercepted a missile; then July 19, 1962, that it intercepted an ICBM; and December 12, 1962, that it intercepted a simulated nuclear warhead. By this time, the Army Missile Command (MICOM), which incorporated both the ABMA and ARGMA, had proposed a plan to deploy the system to 70 sites at a cost of $8 billion. While Secretary McNamara opposed this plan because of the cost, he did agree to provide $270 million for continued research and development for the program, which the Army renamed Nike-X in 1963. The technology improved, but the price for the technology also increased. As a result, President Lyndon B. Johnson decided in late 1964 to keep it a research program. [3]

There were many reasons for opposing the BMD system. Despite successful intercepts, an article in 1964 argued, many scientists believed "defense against thermonuclear attack is impossible … essentially unsolvable," and a "forlorn hope," and that there was "no technological solution" for the arms race.

Within a year, the Army had solved most technical issues, including traffic-handling through layered radar systems, discriminating and targeting warheads instead of launch vehicles and eliminating decoys.

By 1965, most arguments against the BMD system hinged more on political and economic than technical considerations, such as whether to protect hard (military) or soft (civilian) targets and whether to focus on a point or area defense. Cost was a deciding factor. A complete BMD system was far more expensive than the current military strategy of mutually assured destruction. Opponents argued that since both countries could destroy each other through nuclear annihilation, the USSR was kept in check.

Then through the Ballistic Missile Early Warning System (BMEWS) being implemented, U.S. forces had roughly a 20-minute warning after detecting a missile launch to response and launch U.S. missiles and scramble nuclear bombers to wipe out the Soviet Union. This strategic balance between the East and West led the Soviet Secretary General Nikita Khrushchev to proclaim a "peaceful coexistence" with the U.S.

In this environment, a BMD system was destabilizing because it nullified the deterrent forces of the other. The Soviets were actually the first to upset this balance by implementing a BMD system around the Moscow missile field, although most saw this as fairly minor. Instead, many argued BMD was needed only for the "Nth country" – smaller, rogue nations that gained nuclear weapons. This seemed an unlikely prospect in 1964, but the situation rapidly changed.

In 1964, China tested its first nuclear device; in 1966, it tested its first ICBM; and in 1967, it tested its first thermonuclear device. The U.S. considered China much more unpredictable. Proliferation and accidental or rogue launches were deemed much more likely with China than with the Soviet Union, which sought to maintain balance. Pressure mounted to implement a BMD system despite the costs. It was this that ultimately led to the deployment of the Nike-X. [4]

In 1967, at the request of Secretary McNamara, the Army developed a new plan to implement Nike-X, Plan I-67. After an analysis of the Soviet BMD system, the plan explained the difference between a "thick" and a "thin" system. A thick system provided protection of soft targets, focused on major population centers, required many more sites, and would cost up to $10 billion. The plan admitted that an offensive strategy (MAD) was much

more cost-effective than a thick BMD to achieve protection since a thick system had to be 100 percent effective to be successful. A thin system focused on area defense near hard targets, such as missile fields, major military bases and the largest population centers, in which a few missiles slipping by would not be catastrophic. A thin system would reduce the number of sites from 70 to fewer than 25, which greatly reduced the cost of implementation. Suddenly, the deployment of Nike-X became economically feasible.

On September 18, 1967, Secretary McNamara gave a major speech on missile defense to the United Press International in San Francisco, California. Many assumed he was going to recommend continuation of the research program. Instead, he announced deployment of a $5 billion BMD system.

"China has been cautious to avoid any action that might end in a nuclear clash with the United States – however wild her words – … but one can conceive conditions under which China might miscalculate," he argued. "There are marginal grounds for concluding that a light deployment of U.S. ABMs against this possibility is prudent." Such a system, although ineffective against a "sophisticated Soviet offense," would protect U.S. ICBMs and could be expanded if the Russians expanded their ABM system and so "preserve our overwhelming assured destruction capability." It would discourage proliferation while protecting a portion of the population against rogue attacks. On November. 4, 1967, the Department of Defense announced the name of the system as SENTINEL. [5]

The system as proposed in I-67 included five major components. Perimeter Acquisition Radars (PARs) would acquire and track missiles approaching U.S. airspace with a range up to 1,000 miles. Missile Site Radars (MSRs) would guide the interceptor missiles and help to discriminate targets. One of several Remote Launch Sites (RLS) would then launch the missiles. For long-range exo-atmospheric interceptors, SENTINEL used the Spartan missile. The plan originally required 480 of these, although later plans reduced the number to 220. For short-range interceptors, it used 450 Sprint missiles. Both carried nuclear warheads to ensure destruction of the incoming warhead, though of much smaller size than an ICBM. The system would include 17 sites with MSRs – 15 in the continental U.S. and one each in Hawaii and Alaska; four would be collocated with Minuteman ICBM fields to protect them, and one site would protect Washington, D.C. Some of the MSRs would have multiple faces to track missiles from various directions. There would be six PAR sites along the northern border of the U.S. to monitor Chinese ICBM threat corridors. All sites would have Spartans except for one in Hawaii because of the islands' small size. All the MSR sites would have Sprints. Each site had to be self-contained to survive nuclear attacks at other locations. Thus, in addition to the technical facilities there were also barracks and recreation facilities.

Although Congress continually pushed to enlarge the system with other sites in a "thick" configuration, it remained a "thin" deployment. For the system to be effective, the Army had to implement it as fast as possible. Thus, there was a need for rapid engineering and construction of the facilities. [6]

The Huntsville Division

These developments, while rapid, did not catch the Corps of Engineers completely off guard. The Headquarters of the U.S. Army Corps of Engineers (HQUSACE) had been developing plans to support the BMD program for more than six months. In December 1966, the Nike-X System manager had assigned the Corps of Engineers responsibility for construction of all facilities should the system be deployed.

HQUSACE stood up a Nike-X cadre and planning group in early 1967 to begin planning for deployment. Personnel hired in this group would form the core of the new Nike-X Division. There were also personnel in the Power Systems Section of the Advanced Technology Branch in the Office of the Chief of Engineers who were researching the power requirements for the radar systems. Altogether, there were more than 20 people in the Washington, D.C., area working on the program.

In addition, HQUSACE directed the Mobile District, which managed Corps construction projects in Huntsville, to begin facility criteria development. By that fall, there were 31 personnel working on various aspects of the project in Mobile.

In May 1967, HQUSACE completed a mobilization plan, which it would implement if the Army decided to deploy Nike-X. It contemplated the formation of a Nike-X division (CENXD) reporting directly to the Chief of Engineers and anticipated gradual growth as the division built the national system. HQUSACE would stand up the division in three phases.

Phase 0 would include all planning prior to the directive to deploy (D-day) and would include building up organizations to form the core of the new organization. "These elements have been organized and developed with a view toward their inclusion in the CENXD."

Phase 1 would last from D-day to formation of the Nike-X project office, which it projected at 180 days. During Phase 1, the division would establish its organization, while the Mobile District would administratively support it. In the interim, "R&D [research and development] construction will continue but no tactical site construction will be initiated." Strength would top off at around 136. The plan included organization charts and tentative staffing for various project elements.

Phase 2 would last from D+180 until award of the first construction project six months later (D+360), after which the division would reach a strength of 527. The plan turned out to be pretty close to correct in terms of organization and phases of the new organization, but it underestimated the speed with which the Army would move to deploy SENTINEL once given approval to proceed.

As it turned out, Phase 1 took two months, and Phase 2 a little over six months. This accelerated schedule put great strains on the nascent organization and its personnel. [7]

On October 9, 1967, about three weeks after Secretary

McNamara's announcement, the Office of the Chief of Engineers issued General Order 17, which officially established the U.S. Army Engineer Division, Huntsville, October 15.

Because of the sensitivity of the project, the Corps of Engineers did not make an official announcement of the formation of the division until December. The Huntsville Division would be under the operational control (OPCON) of the BMD System Manager and would be collocated with the BMD System Command.

Brig. Gen. Robert P. Young
October 1967 - November 1970

At the time of the division's formation, the Nike-X program had not been named. Initial personnel authorization for the division was 136 civilians and four officers; the first to transfer to the new unit was Brig. Gen. Robert P. "Rip" Young, who officially took command October 17. Young was a perfect choice for the assignment; he had previously worked on the Manhattan Project developing the first U.S. atomic bomb and had recently served as the commander of the Corps Europe Division building military facilities, including missile launch facilities. He did not gain a deputy until Col. George A Rebh, former commander of the Tulsa District, joined the unit November 27.

Per the Nike-X division mobilization plan, the core of the unit during its early days was the 20-odd personnel from the Nike-X Cadre and Planning Group at HQUSACE. These personnel initially occupied offices on 421 King Street in Alexandria, Virginia. Personnel in Mobile continued to work in South Alabama, temporarily.

On November 4, 1967, the Department of Defense renamed the program SENTINEL and assigned Lt. Gen. Alfred D. Starbird as the SENTINEL System Manager. He established the SENTINEL System Command (SENSCOM), which would be located in Huntsville. Immediately, the Huntsville Division began to plan its relocation. [8]

Huntsville was a boomtown in the 1960s. A decade after the ABMA had moved to Redstone Arsenal south of Huntsville in 1950, President Dwight D. Eisenhower had established the National Aeronautical and Space Administration (NASA), whose first director – von Braun – sat at the George C. Marshall Space Flight Center on Redstone.

Employment at NASA had grown from 500 to a peak of 7,719 in 1965 and from $352 million to $658 million in contracting. Employment by ABMA or MICOM, although less, added to these numbers.

Huntsville's population had grown from 16,000 in 1950 to 137,000 in 1965; around 700 percent growth. The number of manufacturing businesses quadrupled from 1958 to 1963. Electronic contractors were particularly prominent, with names such as SCI Systems, Brown Engineering, Boeing Company, Chrysler Corporation, McDonnell Douglas Technical Services, Morton Thiokol, Rockwell International and Wyle Laboratories.

After looking for office space, the division found new offices at the Huntsville Industrial Center, formerly the 800,000-square-foot Lincoln Mills on Meridian Street in Huntsville. NASA, the Army, and numerous Apollo Program contractors also had offices there, including Chrysler, Boeing and Brown. The facility could house 6,000 and had a suitable utility infrastructure.

Since the Mobile District lacked the funds to purchase equipment for a whole division, on November 29, MICOM and Redstone Arsenal agreed to provide local support services to the division, including cars, furniture, supplies, printing services, and medical and dental services. On December 15, division offices in Alexandria closed, and the new office in Huntsville opened December18. At that time, 31 personnel from the Mobile District officially transferred to Huntsville. [9]

The division grew rapidly. By the end of 1967, there were 64 personnel present for duty and another 31 positions had been filled. As the division began its work, it always seemed behind in hiring.

On December 4, the division submitted requirements for a table of distribution and allowances (TDA) structure of 515 personnel. The division received verbal authorization for another 90 spaces in April 1968, raising the total to 230. By the following month, the division had 212 personnel.

By the next fiscal year, it received authorization for 420 spaces and had filled 322. The plan was to gradually increase numbers until reaching a planned strength of 544 in 1971, plus an additional 1,326 in field offices.

The first organization chart, published in October 1967 based on the Nike-X organization, was unusual in that it included two engineering divisions, one for facilities and one for systems. Thus, from the beginning, the division had a much more technical workforce and was much less civil works-oriented than most Corps districts.

The chief of the Facilities Engineering Division was Joe Harvey, formerly chief of engineering at the Canaveral District, the Corps' organization responsible for constructing launch facilities for NASA. With him came Emil Vuch, the chief counsel of the Canaveral District. Chief of the Systems Engineering Division was John P. Cooney, formerly of the Mediterranean Division, where the Corps had built military facilities for NATO forces.

Thor S. Anderson transferred from the Defense General Supply Center to take over procurement efforts for the new division. Cold weather construction expert Barney P. Trawicky, formerly of the Alaska District, became the chief of construction, and Richard A. Malm of the Corps Field Support Group, took over as the chief of data processing.

Thus, the leading members of the division had many years of experience in building or supporting complex military structures. Although most offices in the division were not fully functioning until May 1968, the division began to take over contracts and missions starting in March.

By October, Brigadier General Young observed, "In looking back over the past 12 months, I view our progress with great satisfaction. Starting with a cadre of only six people, we've assembled a staff of highly competent and dedicated people." [10]

In the initial task assignments of November 4, 1967, the Army reiterated the need for the Corps to purchase real estate, design and build facilities, and procure equipment for the BMD system. SENSCOM would maintain budgeting authority for the program, and all supporting agencies would submit budget and manpower requirements to it. It would then distribute funds. This meant that the work the Huntsville Division performed for SENSCOM was reimbursable.

Over the next six months, the Chief of Engineers worked with Lieutenant General Starbird to refine the relationship with SENSCOM. Since the relationship was not a standard definition of OPCON, Lieutenant General Cassidy clarified February 15, 1968, that "it means direction of what to do but not how to do it."

In other words, SENSCOM would set priorities and delivery dates, provide technical direction, and allocate resources but would not dictate design or construction techniques, contracting policies or performance reviews, organizational structure, or internal processes.

"I believe this arrangement will give you what you need and at the same time provide the latitude I need to bring my total resources to bear," he wrote.

On May 14, 1968, the Huntsville Division signed a memorandum of agreement with SENSCOM laying out the responsibilities of both organizations going forward. In it, the division agreed to coordinate with SENSCOM on design issues and public affairs and that it would set schedules and establish design criteria based on SENSCOM input. It would not compete contracts without permission except architect-engineer contracts for the SENTINEL program. [11]

Funding was an issue that greatly concerned the division during its early days. Of $6 million available in late 1967, the division required $2 million for administrative costs of standing up, such as salaries, facilities, etc. It made an urgent request to get the other $4 million to be able to start operations and award the first contracts. The first budget request submitted that fall was for $264 million, added to the $597 million already requested by SENSCOM that year. Because of delays in Congress passing a budget for the program, the division did not receive funds until February.

Yet even this budget proved tight, so much so that Brigadier General Young expressed concern to SENSCOM that the division would have problems staying in budget. Part of this was due to inflation: wages grew up to 5.4 percent faster and material costs up to 7.4 percent faster in 1968 than in previous years.

In addition, the BMD system was still evolving. Modifications in the program, although fewer in number than in 1967, would cost more because of ongoing design, increasing contract values by up to 25 percent. It was critical for the division to be as cost-effective as possible. As a result, process improvement efforts started early.

These included a study to reduce paperwork in October 1968, reorganization of the executive office to eliminate an assistant division engineer in February 1969, a study of recurring reports in September 1969, and a work simplification study in October 1969 that proposed annual savings on research and development processes, transportation and storage.

Also in 1969, the division began to adopt value engineering, along with the rest of the Corps. Value engineering was a cost-saving measure developed after World War II in which engineers and architects reviewed designs for improvements or lower-cost components and resolved conflicts through workshops before construction.

The Corps had adopted value engineering in June 1969 and introduced all divisions, including the Huntsville Division, to it that fall. Jim Ferguson, who later became head of the Huntsville Value Engineering Office, was a recognized expert in the field and led the program for many years. Individual value engineering proposals over the next four years saved anywhere from $1,100 to $5.5 million each. The total first-year savings amounted to $15.8 million, and the total savings over four years amounted to $29.3 million. [12]

Perhaps the largest cost-saving measure the division adopted in its early months was to increase reliance on districts to assist with site selection and construction oversight. The division had originally planned to directly manage dozens of area offices, but soon realized it was inefficient to maintain the offices, send people to research sites or coordinate with contractors, and make ongoing corrections to equipment after construction.

On February 8, 1968, Brigadier General Young proposed using local districts to establish area offices and giving them sufficient contracting officer responsibility to oversee work. In addition to reducing costs, this also had the advantage of motivating district offices to support the SENTINEL program and assign their best people. Instead of creating resentment at having another Corps organization working in district area of operations, the division would become the client agency and employer of the districts. The districts would perform local work such as site investigations; provide real estate services; and manage, supply and provide administrative support to area offices, but the division would maintain control over design, contracting, funding, communications and quality control.

In essence, the district handled local affairs but reported to the Huntsville Division rather than its own division on all issues related to the SENTINEL program. To get the districts and

other divisions on board with this plan, Young held a conference in April to brief them on the SENTINEL program. The final plan, submitted to the Chief of Engineers in September, provided for the division to fund slots and facilities and to provide the field office engineer and most staff, but the districts would conduct site investigations and provide support services. [13]

Initial Progress on SENTINEL

The Corps had issued contracts for the Nike-X design even before the Huntsville Division had enough people to manage them.

The Mobile District had issued the first contract to Parsons Corporation in late 1966 to develop criteria for the MSR radar facilities. The district also issued a design contract for nontechnical facilities supporting the PAR radar facilities December 7, 1967, for $123,000.

Although the division assumed management of criteria development in late 1967, it lacked the personnel to execute or manage most contracts during the first few months, so the Mobile District provided contracting support.

The Baltimore District, which often supported HQUSACE, awarded a contract for $1.6 million to Bechtel Corporation February 12, 1968, to develop power plant criteria for the PAR. The Huntsville Division assumed control of all of these contracts by March 1968. Because of the tight timelines set by SENSCOM, the division often lacked the data needed to proceed.

For example, it received MSR test data and criteria January 5, 1968, only weeks before issuing its first contract to Parsons January 29 for $4.9 million to design the MSR facilities. These designs included not only the radar but also administrative, security, and recreational buildings. It took more than 840 personnel to man the facilities.

The MSR building was a 231-square-foot underground building with a 79-foot pyramid-shaped turret above-ground, with radar faces on multiple sides. The MSR design was 60 percent complete by July, and 75 percent complete by September.

Part of the delay was determining what level of shielding the radar should have, and Parsons did not complete the shielding study until November 22. The other building designs were anywhere from 30 to 75 percent complete by September. After the design review conference of the MSR January 29, 1969, at Grand Forks, North Dakota, the Phase I construction package was ready to compete. [14] Development of the PAR design was about six months behind the MSR.

Unlike the MSR, which the Army had prototyped and tested on Kwajalein Atoll, there had never been a prototype of the PAR, and it was the PAR that gave the division the most trouble.

Division contracts specialist R.L. Phillips noted that the division had great concerns about the PAR design in late 1967, resulting from a general back log due to a lack of criteria and the small number of contractors capable of executing the job. To address this challenge, the division divided the PAR into multiple contracts.

On May 1, 1968, the division awarded a $940,000 contract to Black and Veatch to design a power system for the PAR, and in July opened bids on a generator system. The division issued the first design contract for a PAR for $3.1 million on June 14, 1968. The design called for a 5-floor building, 120-foot-tall and 204 feet by 213 feet at the base, with one 25-degree sloping side built as the radar face. It was wholly above ground. As it took 300 personnel to man, the PAR site also included numerous outbuildings. By the following month, design of the power system was 30 percent complete and the PAR was 10 percent complete. Meanwhile, by July the division had accepted the criteria for the support facilities. [15]

There were several challenges with the SENTINEL design. One was the need for self-sufficiency. The division's assumption was that, during a nuclear war, operational crews would be isolated from the world. It was therefore necessary to design barracks, dining facilities, recreational facilities, dispensaries, sentry stations, warehouses and maintenance shops for each site, which added to the cost and footprint of the facilities.

Another challenge was the enormous power requirements. The PAR, for example, drew 10 million watts. Attempts to design the power system continued to run into problems until finally the division issued a contract to Booz-Allen on July 22, 1968, to test the PAR power plant design.

In the end, Black and Veatch designed a separate power plant from the PAR and MSR buildings to avoid disruptions in the radar field due to the electrical output. A third challenge was the need to build the facilities capable of withstanding a nuclear blast and subsequent aftershocks.

When contractors developed the first hardness estimates for the PAR and MSR on April 10, 1968, they determined the facilities would be exposed to a considerable amount of radiation from the front. As a result, the division recommended in May to ray-shield the entire building at additional expense. Additional design changes to protect the facilities from electromagnetic pulse (EMP) would increase site costs by $3 million.

At a design conference on Redstone in August 1968, SENSCOM and the division decided to proceed with ray-shielding and other protection despite the cost increases. Design issues with ground motion due to shock and vibration from nuclear explosions resulted in the division having to incorporated hydraulic springs into the foundation design of the PAR and MSR to protect facilities, which required access to a large water source.

The division contracted Wyle Laboratories and two other commercial labs in Huntsville to conduct shock testing; recognizing that there was no such facility at the time capable of generating the level of shock needed to fully test the design.

As a result, the Corps' Construction Engineering Research Laboratory at Champaign, Illinois, built what was at the time

the largest bi-axial shake table (12-by-12 feet) capable of holding 12.5 tons and generating vertical and horizontal accelerations of 28 and 15 Gs. Testing would continue through 1974.

A fourth design challenge was the constantly changing criteria and designs. Because of the compressed production schedule, the division had to take the unusual step of completing criteria and beginning design at the same time; beginning construction before designs were complete, and beginning facility construction before site preparation was complete.

This schedule became a serious issue with the PAR because there were no prototypes so design concepts were mostly untested. As a result, there were numerous design changes that created additional cost.

The MSR design continued to change through midsummer 1968, but the PAR design continued to change throughout the fall until finally the division "froze" the design on October 11, 1968, to be able to finalize it, and even then there were some later alterations.

The division did not begin testing designs until August 1969, just before construction started. Finally, there were serious challenges with parts availability because of the need to simultaneously build dozens of highly technical facilities that were nearly identical.

To reduce this requirement, the division sought to standardize components as much as possible and ended up using only 1,703 makes and models for 10,098 line items. The division estimated this would save $38 million per site and speed construction. The MSR generator was the first such standardized item, contracted on November 7, 1968. [17]

While design was proceeding, the division began to identify construction sites. The original program called for 17 MSR sites, an equal number of RLS sites, and six PAR sites.

In November 1967, the division announced the site locations, subject to change: Boston, Massachusetts; Detroit, Michigan; Chicago, Illinois; Grand Forks Air Force Base, North Dakota; Malmstrom Air Force Base, Montana; Seattle, Washington; New York, New York; Washington, D.C.; Warrant Air Force Base, Missouri; Kansas City, Kansas; Salt Lake City, Utah; Omaha, Nebraska; Sacramento (later San Francisco), California; Albany, Georgia; Dallas, Texas; Los Angeles, California; and Oahu, Hawaii.

The same month, the division also released a site selection manual that provided guidelines about utility requirements, amount of space in front of radars, foundation and space to allow design modifications. It recommended 282 acres for an MSR with Sprint and Spartan missiles, 297 acres for a PAR, and 73 acres for an RLS.

The site selection process included site reconnaissance and validation, in which the division conducted records and map research and checked the availability and desirability of locations; site investigations, which included foundation and soil testing; site surveys, used to develop specific designs; and real estate transactions to purchase selected property, although the phases often overlapped or were highly truncated because of the schedule.

By the end of 1967, the division had already started investigations of four sites. However, the process turned out to be more complicated than expected. There were major delays due to frozen ground in the northern states, which prevented soil testing, and the division found considerable local opposition to Army land purchases, particularly near large cities. Despite this, by June 1968, the division made considerable progress in selecting specific property in Boston, New York and Grand Forks, with locations at Detroit, Chicago and Seattle waiting on SENSCOM approval.

Even as the division proceeded with investigations and surveys of these sites, SENSCOM required alternative sites to replace preferred sites in case deals fell through. [18]

The first site to proceed to construction was the PAR site at Sharpners Pond near Boston. The Huntsville Division issued the Phase I contract on September 19, 1968, to George Brox for $767,242.

Phase I included site preparation, construction of access roads and offices, leveling and clearing the site, and excavation. Brox opened a construction office September 24, and the following day the division held a public meeting at Andover, Massachusetts, to present the project to the public. About a hundred people showed up.

The biggest concern at this site going forward was the noise level from construction disrupting local neighborhoods. The division followed this in November with a meeting with labor unions to discuss labor issues. Although the division awarded the Phase II contract for the foundation of the PAR for $2.3 million by January 1969, the design was not complete, and Congress had not appropriated funds.

In any case, Phase I was not complete until April 1969, which prevented construction of the PAR in Phase III.

Meanwhile, the division had also proceeded with the MSR site. It had selected a site on October 25, 1968, at Camp Curtis Guild, a National Guard training area near Boston, and opened bidding for Phase I construction on February 18, 1969.

At Grand Forks, the first site selected had a poor foundation, and the division worked to find another. Nevertheless, by August 1968, the division was preparing maps of the MSR site.

In Chicago and Detroit, meanwhile, the division was unable to proceed because of local opposition to obtaining rights of way to conduct site investigations; it had to work with local politicians to win support, a lesson applied to later sites.

It took until August 1968 to select a site at Troy near Detroit and January 1969 before starting subsurface investigations, but

SENSCOM suspended the site after an aerial survey demonstrated its unsuitability. At two other sites, the division was unable to obtain rights of way.

In Chicago, SENSCOM approved a site near Libertyville on December 12, 1968, and the division planned a site conference for the MSR site in January 1969.

SENSCOM also approved a site near Richardson East in San Francisco, but work on the site was held up by relocation of a radio station on the property. After selection of a site in Seattle, the division opened up negotiations for property for an MSR site in January 1969. The same month, the division presented site candidates for Dallas to Lieutenant General Starbird. In Salt Lake, the division continued to conduct surveys to find additional locations. [19]

Although the division made progress, it still encountered problems with funding and a constrained schedule. Because of SENSCOM pushing to start construction, work nearly always outran appropriations. This despite requirements to provide Congress a 30-day notice to lodge objections before an acquisition.

As late as early September 1968, Congress still had not appropriated funds for acquiring real estate for the program, although the division believed the funds were not contested, only the request to proceed. Some cost constraints were due to continual late design changes or inflation. The division estimated design changes such as an addition of EMP protection would cost $35 million over the course of the year.

In the case of the Boston PAR, SENSCOM pushed back and shortened construction by six months (from 25.5 months) to allow evaluation of the system, and the division estimated this would increase construction costs by 35 percent or $10 million.

In April 1968, the Huntsville Division commander notified Lieutenant General Starbird about inflation impacting construction costs and the estimated budget.

In September, SENSCOM learned that the approved budget had $750,000 less than requested for research and development. These issues required considerable reworking of the schedule and reallocating $68 million in military construction funds. They were able to work out most issues in a September conference, but there was no plan for configuration control until late 1968; until then, cost control at the construction sites remained a problem. [20]

However, the primary challenge the division faced in construction of SENTINEL was widespread protest. While the first public meeting in Boston had gone well, in Chicago and Detroit opposition started to build. This pressured local officials to deny the Corps rights of way to investigate some properties. A large part of the opposition originated with grassroots activists. The events occurred in the midst of widespread antiwar and antinuclear protests.

Only a few months earlier, in August 1968, antiwar riots had disrupted the Democratic Party National Convention in Chicago, and popular protests against the BMD program seemed to spread from Chicago after November 1968. Joining this political base were a number of scientists – including David Inglis of the Argonne National Laboratory in Chicago, chairman of the American Federation of Scientists; Jerome B. Weisner, the former chairman of the Science Advisory Committee under President John F. Kennedy; and George W. Rathjens of MIT – who argued against the effectiveness of a BMD and opposed placing nuclear weapons so near a major population center.

By January 1969, opposition to the program reached its political apex. Complaints of the program had been growing in Congress for months, and mail sent to congressmen was running 20-to-1 against it.

On January 15, the House Appropriations Committee held hearings on funding of the program. Rep. Sidney Yates of Illinois, who had voted against SENTINEL in 1967, continued to express his opposition to placing nuclear weapons "on the doorstep of cities."

In response, Lieutenant General Starbird stated that the Army had chosen the Chicago area because it was a Chinese target, and they had chosen the Libertyville site because it could provide a higher level of protection than more remote sites. As for the possibility of a nuclear accident, he reiterated that "U.S. nuclear weapons are designed with a series of safety devices so that the likelihood of any nuclear yield in case of an accident is essentially nil."

On January 29, when the division held a public meeting for the MSR site at Reading, Massachusetts, some 1,800 protestors showed up and shouted down Corps representatives. After this contentious display and at the urging of Weisner, Rathjens, and others, Sen. Edward Kennedy of Massachusetts wrote a letter to incoming Secretary of Defense Melvin Laird calling for a halt in construction based on questions about the technical feasibility of the program, strategic impact on the arms race, safety of nuclear devices, cost, and funding priorities. [21]

From SENTINEL to SAFEGUARD

In January 1969, Richard M. Nixon became president. One of the first issues that garnered his attention was the SENTINEL program, which many in Congress were criticizing. Elected partly on a platform to end the Vietnam conflict, his administration was sensitive to the pressures of popular protests.

When Kennedy opposed the program in the Senate and Rep. Mendel Rivers of South Carolina informed Secretary Laird that the House Appropriations Committee would not approve additional acquisitions for SENTINEL, the Nixon administration capitulated in early February.

On February 6, Laird announced the government would halt all construction on the program pending a review of its goals by the president. The same day, Laird ordered construction in Boston halted, but he permitted continued site validation in case the president decided to proceed with SENTINEL as planned.

The Army completed this new "I-69" study on February 20, 1969. It presented four options: cancellation of the program, continuation of "thin" protection, providing "thick" protection to 25 states, or reducing the thin protection to defend only existing ICBM fields. It recommended a scaled back thin deployment at 12 sites, with seven PARs to detect launches.

The Department of Defense presented these options to the National Security Council. At the same time, many in the press spoke out against a BMD program of any scale, and numerous scientists and congressmen lobbied Nixon to eliminate the program. [22]

President Nixon released a statement announcing his decision March 14, 1969. He rejected SENTINEL as insufficient because it "did not provide protection against some threats to our retaliatory forces;" he argued "it is not now within our power" to implement an effective thick system; but he also believed "giving up all construction of missile defense poses too many risks."

These included expansion of Soviet BMD, development of first-strike capabilities such as submarine-based missiles, and Chinese and rogue threats. Instead, he chose the scaled back system proposed by the I-69 study to protect ICBM fields for $3-4 billion, a little over half of initial estimates for SENTINEL. This moved system components away from civilian areas.

Since the "defensive intent is unmistakable," he argued "the program is not provocative" and would have no impact on arms limitation talks with the Soviets. He stressed that, unlike SENTINEL, which attempted to implement an entire system at once, his program would annually review strategic requirements and "insure that we are doing as much as necessary but no more than that required by the threat existing at that time." At a press conference the same day, he stated, "the new program … is one that perhaps best can be described as a safeguard program."

Shortly thereafter, the Defense Department renamed the revised program SAFEGUARD. The decision seemed to placate some opposition to SENTINEL, primarily Nobel Prize winner Hans Berthe of Cornell University, but there remained considerable opposition from others, including former Defense Director of Research Herbert F. York, who argued SAFEGUARD was unnecessary to protect the Minuteman fields, incapable of working as designed, and in fact would be harmful to negotiations with the Soviets. York remained convinced of the "utter futility of attempting to achieve national security through military technology alone."

A New York Times editorial the day after the announcement called it "a project as wasteful as the Pyramids and not much more useful."

Debate in Congress raged over the spring and summer. After the Senate Armed Services Committee approved SAFEGUARD in the 1970 Defense Authorization Bill on June 27, the full Senate took up the bill July 9.

Voting began August 6, when the Senate voted down the efforts of Sen. Marge Chase Smith of Maine to strip out $760 million in SAFEGUARD funding from the bill. It defeated her second amendment to keep SAFEGUARD a research project only after Vice President Spiro Agnew broke a tie. It was, Brigadier General Young observed, "Truly an historic vote." Congress passed the bill with SAFEGUARD intact in November 1969. [23]

According to the I-69 plan, the president would install 12 sites in two phases. Phase I, which Nixon initiated in May 1969, provided for starting construction on a PAR and MSR each at Malmstrom Air Force Base and Grand Forks to protect missile fields.

Phase II included three options depending on the threat. To protect only Minuteman sites and the capital against accidental launches or rogue threats, the president would also install components at Whiteman Air Force Base, Missouri; Warren Air Force Base, Wyoming; and Washington, D.C.

To counter an increased Soviet threat, the president would install all 12 sites focusing on hard targets. To counter an increased Chinese threat, the president would install 12 sites focusing mostly on soft (civilian) targets. The 12 sites would include one in the northeast and in Florida on the East Coast, one in the Northwest and two in California in the West, one in Texas in the South, and one in Michigan in the North. The Army would re-site all facilities away from civilian populations.

Although the president touted the cost savings from implementing fewer sites, in fact the Department of Defense later noted the cost would be up to $7 billion depending on the option selected. If the president chose 12 sites, it would actually cost about $1.5 billion more than the cost of SENTINEL in 1967, mainly due to inflation.

Of course, unlike with SENTINEL, the Army would use funds for SAFEGUARD over time since construction on some components would not begin until 1972 or later. With the $800 million left over from SENTINEL, the SAFEGUARD budget for 1970 was more than $1.5 billion, of which $270 million was for military construction. Congress appropriated $1.5 billion for 1971 and $1.1 billion for 1972.

By this time, protests had dwindled to almost nothing and had shifted primarily to political and economic reasons against the system. Although some congressmen continued to vote against the program, it never reached the level of concern as it did in August 1969.

In January 1970, the president added a third site to the initial two and approved site selection to begin at five other sites in what some called a Modified Phase II since he only implemented the plan in part. [24]

The Army began to transition to SAFEGUARD almost immediately after the president's announcement in March 1969.

The SENTINEL System Manager and SENSCOM became the SAFEGUARD System Manager and SAFSCOM, the latter

of which relocated its offices to the new Cummings Research Park in Huntsville, near the University of Alabama in Huntsville (UAH).

In 1961, von Braun had urged the Alabama Legislature "to make Huntsville more attractive to technical and scientific people" by improving "the academic and research environment" through expansion of the local university branch into UAH and the establishment of Cummings Research Park. It quickly became the home of leading aerospace and technical companies.

The Huntsville Division relocated to the SAFEGUARD Annex in the park in April 1969. By July, it had terminated the Boston Phase II contract, retasked the Phase I contractor to turn the PAR site into a recreation area, and realigned the generator contract. The division signed a new memorandum of agreement with SAFSCOM May 14, 1970, and received a new tasking order from Lieutenant General Starbird in June 1970 even as it continued work under the old ones.

Brig. Gen. Bates C. Burnell
November 1970 - April 1973

These documents were nearly identical to those under SENTINEL. The division also initiated new agreements with the districts involved in the SAFEGUARD sites, primarily Omaha, Seattle, and Kansas City districts. These agreements mostly reiterated Engineer Regulation 10-1-22, which had formalized activities assigned to districts under the program.

During the SAFEGUARD era, the division went through several major changes. In February 1970, Chief of Engineers Lt. Gen. Frederick J. Clarke had directed all Corps divisions to review organizations for possible consolidation. The Army at the time was beginning to downsize as it drew down forces in Vietnam. SAFSCOM reviewed the Huntsville Division's organization and agreed some reduction was possible. As a result, Brigadier General Young initiated a manpower study in April. The final organizational change, published in June 1971, combined the separate engineering divisions and also added a Value Engineering Office in the Executive Office. In November 1970, Brig. Gen. Bates C. Burnell, formerly the deputy division engineer, succeeded Brigadier General Young as its new commander. [25]

Even as the division began negotiations to close out the SENTINEL contracts, it continued work on designs of the facilities. In June 1969, the division met with contractors to modify the facilities for SAFEGUARD, which required renegotiation of the original contracts. Of the original components, the PAR design changed the least since the plan on how to use the PAR had not changed significantly. It remained a large building with a radar face on a single side. The division shelved the multi-faced PAR design until a need arose.

After the division worked out most major design issues, SAFSCOM reviewed the final design in December 1969. The MSR design changed the most, primarily through the addition of three radar faces to allow monitoring in all four directions, the enlargement of the pyramid-shaped turret, and combination with the Missile Site Control (MSC) design. The division had developed an MSC design similar to the prototype developed on Meck Island and to the original MSR design, but slightly smaller. Since the MSR was on its turret, many sources conflated the two terms. Thus, the MSC became the "nerve center" of the SAFEGUARD site. The division revised the MSR power plant for continual operation, added in additional turret shoring, and added a tunnel between the MSC and the underground power plant.

The final review of the revised design occurred in September 1969 for the MSR and December for the power plant. Most of the other designs changed very little. Despite this, Brigadier General Young observed, "We need additional time to accomplish all of the new design and the redesign that has resulted from the change in the program." He estimated construction would not proceed until the following year.

Over the next few months, the division prepared bid packages for the SAFEGUARD facilities that included 2.6 million pages of engineering designs and 4.3 million pages of specifications. Each bid package weighed 10 tons; the division had to borrow a warehouse on Redstone Arsenal to store and ship the packages.

Then, from January 1970 to December 1971, the division prepared and issued 100,000 shop drawings for contractors, amounting to roughly 135 per day. [26]

Since the first two SAFEGUARD sites announced were also part of SENTINEL, site selection was greatly advanced. The first site announced in November was near Grand Forks Air Force Base.

After searching the region, the division selected a 433-acre MSR site at Nekoma, North Dakota, and a 274-acre PAR site at Concrete about 90 miles northwest of the air base. It opened an area office in nearby Langdon in November, near the PAR site. Construction of access roads was complete by the end of 1969, and the division negotiated with the Northern Railway Company to lay down a rail spur to Hensel to allow delivery near the construction sites.

The closest water source was the Fordville Aquifer – a water-bearing strata of permeable rock – and after holding a public meeting, the division issued a contract to Zurn Engineers for $3.8 million to build a system of wells and reservoirs along with 58 miles of pipeline to the MSR and PAR sites.

In Grand Forks, the division took the unusual step of advertising construction in a single contract.

On March 31, 1970, the Corps awarded a $137 million contract to Morison-Knudson to build the two facilities. It was, at the time, the single largest contract award by the Corps to date for any project. Over the course of the following year, peak

employment reached 2,500 contractors and 60 Corps employees. The contractor completed the first floor slab in August 1970 and the fourth floor in September 1971 and pushed to complete the roof before winter. The contractor placed the final concrete in the MSR October 12, 1971, and the PAR two weeks later.

On August 4, 1972, the Corps awarded a $1.1 million contract for maintenance, marking the nearing of an end to the project. After award of contracts for the RLS sites near Nekoma, Adams, Langdon and Walhalla, construction started May 19 and August 30, 1971, with projected completion dates in 1973.

The only interference with the construction came during what came to be known as "International Day against the ABM" protests May 16, 1970. It was, in fact, a late celebration of Earth Day. Protestors around the country held the first Earth Day April 22, and the protests in Grand Forks were an extension of the earlier events. Between 1,200 and 1,500 hippie-types, led by David Dellinger and John Froines of the "Chicago Seven" antiwar protestors, met at the MSR construction site. No one was hurt, and the protests caused only minor property damage. It was, the Grand Forks Herald reported, "more picnic than protest." [27]

At Malmstrom Air Force Base, Montana, the Huntsville Division followed its normal process and awarded Phase 1 contracts for the MSR and PAR in May 1970 for $3.3 million and $4.7 million. These contracts included both site preparation and construction of the foundations. The division opened an area office in March near the Tiber Dam Reservoir in Tooele County, and employment on the site quickly reached 340. To obtain a source of water for the PAR and MSR, the division signed an agreement with the Bureau of Reclamation to access water from the Tiber Reservoir.

On October 22, 1970, the division awarded a $3.1 million contract to build a 26-mile pipeline to the reservoir. By January 12, 1971, the Phase I contractor had poured the final concrete at the MSR foundation, and February 26 the Phase I contractor poured the final concrete for the PAR foundation. After the division submitted a request for proposal for combined construction of the PAR and MSR, the initial low bid ($178 million) came in 17 percent over the government estimate and was rejected.

The division negotiated over the next year and ended with a revised award February 24, 1972, for $160 million; however, it issued a letter contract in December 1971 to allow the preliminary work to proceed. The division announced the RLS sites in late February and early March to include near the Tiber Reservoir and Shelby, Valier and Dutton, Montana.

It awarded Phase I construction contracts for the first two sites for $8.8 million April 6, 1972 and the second two May 5. In the interim, the division announced five potential locations for the Whiteman Air Force Base site January 7, 1971, and completed the design review on January 19. It needed only to select the site and negotiate for real estate. It announced five sites (MSR and four RLS) near Warren Air Force Base, Wyoming, November 10, 1970.

The division also made some progress in site selection for the national control facility near Colorado Springs, Colorado, at Cheyenne Mountain, the North American Aerospace Defense Command (NORAD) headquarters.

The division held a series of meetings through January 1971 with NORAD to determine site locations and the source for water supplies. The Omaha District rather than the Huntsville Division awarded and managed the contracts to build the three buildings starting in December 1971. [28]

Design and construction of SAFEGUARD met many of the same issues SENTINEL had, primarily cost constraints and a compressed schedule. The transition to SAFEGUARD had cost the Huntsville Division roughly $17.1 million due to reorienting the program or related costs, such as closing SENTINEL facilities, moving planned sites, or renegotiating contracts.

In March, SAFSCOM discussed the schedule, which required continued compression of the construction timeline and added to the cost. In this environment, cost controls and efficiency programs were very important. Thus, the value engineering program remained critical to keeping costs low, for example by reviewing heat loss and use of a non-modular design in the power plants.

In design, the major challenge remained EMP and shock resistance. Shock testing of the facilities continued, including more than 350 individual pieces of equipment by 1974, and this resulted in the addition of more than 1,200 shock isolators to designs.

In construction, the most serious issue that arose was a labor relations dispute at Malmstrom. In March, the Montana Contractors Association objected to the use of "building" rather than "heavy and highway" rates, and that contractors did not receive travel or lodging as federal employees did.

By June, the situation became serious enough for the division commander to warn the Chief of Engineers of the possibility of work stoppage if labor demands were not met, which would cost an additional $5 million to $10 million. He recommended intervention of the Federal Mediation and Conciliation Service, which Secretary of the Army Stanley Resor requested. They finally reached an agreement in early November, which included building temporary living facilities for workers on-site, but this placed nearly a six-month delay on the project.

Another issue was the severe cold weather in North Dakota and Montana, where temperatures reached 40 degrees below zero. This required application of winterization techniques, including use of insulated concrete mixers, covering facilities with plywood and plastic sheeting, using space heaters, and covering curing concrete with blankets or tarps. [29]

Despite such issues, construction proceeded rapidly.

Altogether, by the end of 1972 in Grand Forks the Huntsville Division had laid 170,230 cubic yards of concrete, 44 million pounds of reinforcing steel, 2,273 miles of ware, 750 miles of conduit, 40 miles of piping, and 685 tons of duct material, and

A $468 million construction project, the Stanley R. Mickelson SAFEGUARD Missile Complex near Nekoma, North Dakota, became operational on April 1, 1975 and was the largest single contract let by the U.S. Army Corps of Engineers at the time.
(Photo courtesy of Huntsville Center Historical Archives)

it had built or improved 20 miles of roads, installed a rail siding, completed over a million yards of earthwork, and installed 61 miles of water pipeline.

This was enough cement to lay a road 24-foot-wide and 32-miles-long, enough earth to create a mound three stories high, enough steel to build a four-story building covering two acres, and enough wire to run from Huntsville to San Francisco.

By 1971, the division had laid 36,457 cubic yards of concrete and 24.9 million pounds of reinforcing steel, and it had completed 150,000 cubic yards of earthwork and 26 miles of pipeline at the Malmstrom site, which was still far from completion,. These were enormous construction projects; installing 12 such sites would require considerable management and technical expertise and an ability to work across many districts, as the division could.

"Safeguard construction is a big job," Brigadier General Burnell said shortly before taking command, "an engineering job of great magnitude not only in shear structures to be built or in advance planning already done, but in all areas of engineering, procurement, and administration." [30]

The Strategic Arms Limitation Treaty (SALT)

Even as the Huntsville Division had begun construction on the SAFEGUARD facilities, President Nixon had proceeded with negotiations with the USSR to end the program.

The Soviets had indicated a willingness to negotiate with the U.S. on anti-ballistic missile limitations as early as June 1968.

President Johnson had agreed to hold talks in July but never entered into formal negotiations after the Soviet invasion of Czechoslovakia. The Soviets raised the issue again on Nixon's inauguration, and on October 24, 1969, he issued them an invitation to begin talks.

The talks formally opened November 17, 1969, in Helsinki, Finland, to establish guidelines for later negotiations.

In April 1970, during the second round of talks in Vienna, Austria, the Soviets made clear that reductions in their SS-9 ICBMs would be dependent on ending anti-ballistic missile (ABM) development. Although the Soviets had, in fact, been first to develop a BMD system near Moscow in 1966, they regarded the move by the U.S. to implement a nationwide system as upsetting the international balance.

Rather than the "thin" system Nixon intended SAFEGUARD to be, they saw it as the first step toward implementation of a nationwide "thick" system that would have made their own missiles less effective. They argued this was inherently destabilizing because it would lead to escalation and increased numbers of SS-9 missiles, which the Soviets would have to deploy to be able to overcome such a defensive system.

In the end, the U.S. agreed to limit its BMD program.

Some have argued that Nixon had intended to give up

SAFEGUARD all along and had only approved its development as a bargaining chip.

It is unclear that this was his intent when he approved SAFEGUARD. Although Nixon's decision to proceed came before the Vienna conference, the Soviet views on SENTINEL were well known. Still, the president's public and private statements suggest that he was truly concerned about protecting against first-strike capabilities. It seems more likely Nixon proceeded with deployment of SAFEGUARD in case negotiations fell through. He was, in any case, willing to give up SAFEGUARD in return for reductions in Soviet ICBMs, which he believed a better trade. [31]

Negotiations continued through May 1972, when the U.S. and USSR completed what became known as the Strategic Arms Limitation Treaty (SALT I), which included both an ABM treaty and an interim ICBM treaty, interim because negotiations were continuing to make further reductions in the number of nuclear weapons. President Nixon and Soviet Secretary General Leonid Brezhnev signed the treaty May 26, 1972 and the U.S. Senate ratified it August 3.

President Richard Nixon converses with Soviet Secretary General Leonid Brezhnev following the signing of the Strategic Arms Limitation Treaty, May 26, 1972. *(U.S. Historical Photo)*

The ABM treaty limited any BMD system deployed by the two nations to two sites: the capital and one other site.

This allowed both nations to keep complete or near-complete components of their BMD systems already deployed but which prevented further development. At that time, the Department of Defense chose as its two sites the capital region and the Grand Forks area, where construction was most advanced.

However, Congress eliminated funding for Washington, D.C., in the 1973 Defense Appropriations Act. A treaty protocol signed July 3, 1974, later limited ABM deployments to one site in each country: Grand Forks in the U.S. and Moscow in the U.S.S.R.

The ICBM treaty froze the number of existing ICBMs, limited the number of submarine-launched ballistic missiles and required elimination of ICBMs for each launcher constructed. However, the major concession was the antiballistic missile limitations. This may have been due to the Nixon administration's agreement with the Soviet Union that the BMD systems upset the strategic balance, or it may have simply been a way for the U.S. to reach agreement on ICBM limitations, which the U.S. considered more serious. [32]

The immediate result of SALT was a halt on deployment of SAFEGUARD other than at Grand Forks, and an end to urgency at that site.

The day after the president signed the SALT treaty, the Department of Defense ordered suspension of ongoing construction at Malmstrom and the other sites May 27, 1972. However, the department waited until Senate ratification before proceeding with cancellation of the contracts.

On October 2, 1972, the Huntsville Division entered into negotiations with the prime contractors to settle payment for work completed.

On September 11, 1973, the division issued a contract for $879,000 to restore the Malmstrom site back to its original condition. While some work was proceeding on the Grand Forks site, the rest of the BMD program had come to an end, and with it the mission of the Huntsville Division.

The Corps of Engineers had created the division to manage design and construction of missile and radar facilities at a dozen sites for the SENTINEL and SAFEGUARD programs. Without these sites, which the SALT treaty eliminated, the entire purpose for the division suddenly came into question. [33]

By the end of 1972, the Huntsville Division had considerably expanded as it had worked to fulfill its mission of designing and constructing ballistic missile defense system components.

As the division newsletter, the Information Bulletin, observed that year, "the Huntsville Division has grown from the 36 people originally assigned into a highly skilled and coordinated organization capable of assuming and accomplishing any mission."

Although some key personnel had departed, including Brigadier General Young, Joe Harvey and John Cooney, many other talented people had filled their positions. Many of these had become experts in their fields, whether design, construction, or procurement of highly technical facilities, such as missile or radar complexes and high-end generators. The division was a highly efficient and cost-effective organization.

For the year ending June 1972, the division had saved $5.5 million more than goals set by the Corps through its value engineering. It had also saved $519,000 through general management improvements. It had quickly become one of the most technically competent divisions in the Corps with a unique mission that spanned across many states. The division was poised for continued growth and great accomplishments. [34]

The problem was that its primary mission – the SAFEGUARD program – was coming to an end. The SALT

treaty had limited U.S. ballistic missile defense systems to a single location, and the Army decided on the Grand Forks location.

Though construction at the site was nearing completion, the Huntsville Division still had much work to do finishing the buildings, procuring equipment, making final modifications and training personnel to operate them. Yet these activities took a fraction of the division's time and funding.

Cumulative obligations for 1972 had dropped from a planned $371.4 million to $158.1 million. At this level, the division would not be able to maintain a full workforce without other sources of funding, whether from the Corps or from other reimbursable projects. This meant the loss of its vast resource of highly technical and trained personnel, despite how the Corps increasingly saw the division as a resource to solve the most difficult and time-sensitive technical problems. It became urgent for the division to reorient its mission into new areas. [35]

End Notes for Chapter 1

[1] McNamara quote from DOD News Release 898-67, Sept. 18, 1967, p. 19 (Kitchen Notes, HNC Archives). Most of the original source material for the history of HNC no longer exists. When the sources are not available, the author will accept and cite as a primary source the detailed notes of Dr. James Kitchens, author of the original 1978 history.

[2] Adams, *Ballistic Missile Defense* (NY: American Elsevier, 1971): quote on 17; Tom Bower, *The Paperclip Conspiracy: the Hunt for the Nazi Scientists* (Boston: Little, Brown, 1997); Von Braun, *"The Redstone, Jupiter, and Juno,"* in Eugene Emme, ed., *The History of Rocket Technology* (Detroit: Wayne State UP, 1964): 107-115.

[3] Adams, BMD, 17-58; History of Strategic Air and Ballistic Missile Defense, Vol. II, 1956-1972 (Wash., D.C.: Center of Military History, 1975): passim; James A. Walker, Frances Martin, and Sharon S. Watkins, *Strategic Defense: Four Decades of Progress* (Hunts.: U.S. Space and Strategic Defense Command, 1995): 1-26; James Walker, Lewis Bernstein, and Sharon Long, *Seize the High Ground: The Army in Space and Missile Defense* (Hunts.: U.S. Space and Strategic Missile Defense Agency, 2003): 24-49; HND Information Bulletin (Apr. 18, 1975): 2 (Kitchens Notes).

[4] Quote from Jerome B. Wiesner and Herbert F. York, "National Security and the Nuclear Test Ban," *Scientific American* 211:4 (Oct. 1964): 27-35, quotes 32-35; Adams, BMD, 92-101; SENSCOM, "Nike-Zeus and Nike-X Development," N.P., N.D. [Hunts., 1969] (Kitchens Notes): 1-2; *History of Strategic Air and Ballistic Missile Defense*, passim; Walker et al., Strategic Defense, 29-30; Walker et al., Seize the High Ground, 49-53.

[5] Adams, BMD, 165-172; Walker et al., Strat. Def., 30-32; Walker et al., Seize the High Ground, 53-61; *History of Strategic Air and Ballistic Missile Defense*, passim; McNamara quoted in DOD News Release 868-67, p. 19. A number of authors believed that McNamara changed his speech to include the last-minute decision by President Johnson to deploy the system. Reasons for accepting this view include: 1. McNamara had previously spoken out against an ABM system; 2. He mentioned deployment only in the final pages of a speech mostly about the ineffectiveness of an ABM system against the Soviets; 3. He shortly thereafter left the cabinet as though forced out (Adams, *BMD*, 161, Note 18).

[6] U.S. Cong., House, Approp. Comm., Mil. Constr. Approp. Subcomm., *Safeguard Antiballistic Missile System*, Hearings, May 22, 1969 (91st Cong., 1st Sess.): 24-25; HND-PAO, *SAFEGUARD: A Step Toward Peace* (Huntsville: HND, N.D. [1974]: 1; SENSCOM, "Nike-Zeus and Nike-X Development," 3-5; Adams, BMD, 165-172; Walker et al., *Strat. Def.*, 30-33; Walker et al., *Seize the High Ground*, 53-62; *History of Strategic Air and Ballistic Missile Defense*, passim.

[7] Office of the Chief of Engineers, "Corps of Engineers Nike-X Mobilization Plan," Wash., D.C., May 1967 (Kitchens Notes): 1-5, 38-61, quotes on 2 and 4.

[8] OCE GO 17, Col. Miles L. Wachendorf, Organization of U.S. Army Engineer Division, Huntsville, 9 Oct. 1967 (HNC Elect. Files); HND GO 1, BG R.P. Young, Oct 18, 1967 (NARA-Atl. RG 77, Acc. 73A1873, File 1, General Orders [Hunts. Div.]); HND-PAO, *HND Historical Summary, FY 1968* (Hunts.: HND, 1969): 1-13, 44-48, 67 (Kitchens Notes).

[9] Manders, "Rockets and the Rocket City: The Development of a High-Tech Culture in Huntsville, Alabama," paper, unpublished, 1995 (Author's records): 9-14; Memo, F. Barrineau to W.A. Campbell, Comptroller Support, U.S. Army Engineer Nike-X Division, Oct. 20, 1967 (NARA-Atl. RG 77, Acc. 75A1577, File 1, Org Plan Files 1968); HND-PAO, Huntsville Division Historical Summary FY 1968 (Huntsville: HND, 1968-1975, Kitchens Notes): I:1-14, II:62-65; HND Information Bulletin (Sept. 6, 1968): 4 (Kitchens Notes).

[10] *HND-PAO, HND Hist. Sum. FY 1968*, 1--8, 13-15, 21-39, 50-60; *HND Info. Bull.* (June 25, 1971): 1; Draft Org Chart, 1967 (NARA-Atl. RG 77, Acc. 75A1577, File 1, Org. Plan. Files 1968); Young quote from HND Info. Bull. (Oct. 9, 1968):1.

[11] Memo, Starbird to Dist., Task Assignments in Support of SENTINEL Deployment, N.D.; Memo, Starbird, Chief of Engineers Task Assignment, Sentinel System Deployment, N.D. [Dec. 1966]; Quotes from Draft Letter, Cassidy to Starbird, Feb. 12, 15, 1968; MOA, Cassidy and Starbird, Relationships Between the U.S. Army Corps of Engineers and the SENTINEL System Organization in Conduct of the SENTINEL Program, May 14, 1968 (NARA-Atl. RG 77, Acc. 75A1577, File 1, Org. Plan Files 1968).

[12] HND-PAO, *HND Hist. Sum. FY 1968*, 13-15; Memo, Young to BG Starnes, Potential Funding Problems, Nov. 16, 1968 (NARA-Atl., RG 77, Acc. 75A1577, File 17, Cost Growth 1969 File); Memo, Marie R. Parlante, Paperwork Survey (File 15, Management Survey Case Files 1969 [Paperwork Survey]); DF, W.F. Campbell, Organization of the Executive Office, Feb. 12, 1969, and encl. (File 16, Management Survey Case files 1969); Parlante, "Review of Recurring Reports," Sept. 15, 1969 (File 18, Management Survey Case Files 1970); Charles C. Huang, "Report on a Work Simplification Project," Oct. 19, 1969 (File 14, Work Simplification Class); *HND Info. Bull.* (Feb. 26, 1974): 1-2; on the Value Engineering program and timeline, see Web page, "Value Engineering," [2015] (http://www.usace. army.mil/ValueEngineering.aspx, May 4, 2016).

[13] Memo, Young to Chief CD, Responsibility for Operating the PAR and the MSR on the First Site, Apr. 11, 1968; Memo to Chief of Engineers, District Participation in the Sentinel Construction Program, Feb. 8, 1968; "Plan for District Participation in the Sentinel Program," N.D. (NARA-Atl. RG 77, Acc. 75A1577, File 1, Org. Plan. Files 1968); HND-PAO, *HND Hist. Sum. FY 68*, I: 33-34, II: 82; HND Liaison Bull. (Sept. 6, 1968): 1.

[14] HND-PAO, *HND Hist. Sum. FY 68*, I:17-58, II:35; *FY 69*, I:10-26, 77-79; BMSCOM, Summary of the SENTINEL Program, FY 1968 (NP: ND [Huntsville: 1968], Kitchens Notes): 2; Interview, R.L. Phillips, by James Kitchens, 2 May 1977 (Kitchens Notes); James H. Kitchens, III, *A History of the Huntsville Division*, 15 October 1967-31 December 1976 (Huntsville: HND, 1978): 16; HND-PAO, *SAFEGUARD*, 1.

[15] HND-PAO, *HND Hist. Sum. FY 68*, I: 17-58, II: 35; FY 69, I: 10-15; HND Press Release, Jun. 14, 1968 in HND *Liaison Bull.* (Jul. 22, 1968): 1-4; BMSCOM, Summary of the SENTINEL Program, FY 1968 (NP: ND [Huntsville: 1968], Kitchens Notes): 2; Interview, R.L. Phillips, by James

Kitchens, 2 May 1977 (Kitchens Notes); Kitchens, *HND History*, 18-19; HND-PAO, *SAFEGUARD*, 1.

[16] HND *Liaison Bull*. (Jul. 22, 1968): 1-3; HND Info. Bull. (Apr. 12, 1974): 2; HND Hist. Sum. FY 68, I: 27-33, 46; FY 69, I: 14, 21-31, 40-51, 57-62; SAFSCOM, *Summary of Program Progress through FY 1969* (NP: ND [Huntsville: 1969], Kitchens Notes); HND-PAO, *SAFEGUARD*, 3; HND Press Release, Sept. 27, 1968, in HND *Liaison Bull*. (Kitchens Notes); Manders, *Improving the Common Stock of Knowledge: Research and Development in the U.S. Army Corps of Engineers* (Vicksburg: ERDC, 2011): 158-59; Interview, Phillips, by Kitchens, May 2, 1977.

[17] HND-PAO, *SAFEGUARD*, 3; HND-PAO, *HND Hist. Sum. FY 69*, I: 38-57, II: 38-39; Interview, Phillips, by Kitchens, May 2, 1977.

[18] HND, *Anti-Ballistic Missile Engineering Criteria Manual for Tactical Site Selection* (Kitchens Notes): passim; HND *Liaison Bull*. (Oct. 28, 1968): 1-4 (Kitchens Notes); HND *Info. Bull.* (Jul. 22, 1968):3; HND-PAO, *HND Hist. Sum. FY 68*, I:15-24, 35-59, II: 49-59; Memo, Young to Chief of Engineers, Activity Report, Huntsville Division, Mar. 29 and Dec. 20, 1968 (NARA-Atl. RG 77, Acc. 73A1873, File 5, HND Activity Summaries, 1968-1970).

[19] HND-PAO, *HND Hist. Sum. FY 69*, I: 23-53; II: 42, 62-66; HND *Liaison Bull.* (Sept. 6, 1968): 2 and (Oct. 28, 1968): 1-3; HND *Info. Bull.* (Oct. 9, 1968): 1-4 and (Dec. 23, 1968): 1.

[20] HND *Info. Bull.* (Sept. 5, 1969): 2-3; HND *Liaison Bull.* (Sept. 6, 1968): 1; HND-PAO, *HND Hist. Sum. FY 68*, I: 24-31; FY 69, I: 10-20.

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[32] HND *Info. Bull.* (Jun. 16, 1972): 3; (Oct. 16, 1972): 3. For the text of SALT, see website, Nuclear Threat Initiative, "Strategic Arms Limitation Talks (SALT I) (http://www.nti.org/media/pdfs/aptsaltI.pdf, 18 May 2016).

[33] Ibid.

[34] HND *Info. Bull.* (Oct. 16, 1972): 3; HND, "Program Review and Analysis, 4th Quarter FY 72" (NARA-Atl., RG 77 Acc. 75A1577, File 13, Operational Progress Report, 1972).

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2

The Huntsville Division Branches Out, 1972-1977

In August 1974, the Army officially accepted the completed SAFEGUARD ballistic missile defense facility at Grand Forks, North Dakota, from U.S. Army Corps of Engineers contractors who built the facility and from the contractors who helped develop the missile technology for the Army.

At that time, Assistant Secretary of the Army for Research and Development Norman R. Augustine noted the SAFEGUARD system "represents in terms of enormity and difficulty of technical challenge one of the three or four most demanding undertakings in history."

SAFEGUARD had originated as an enormous project involving a dozen geographic locations across the nation, and the Corps had established the Huntsville Division to manage design and construction. The project required broad technical expertise, extremely cost-effective operations, and an ability to work with and through multiple Corps districts. Although after 1974, Congress had limited the program to a single site, that site alone involved the largest contract the Corps had ever competed to date.

With construction on the SAFEGUARD program coming to an end, it was unclear what the division was going to do next. If it had no other mission, there was no reason for the division to exist. [1]

Fortunately for the Corps, the Huntsville Division picked up several new and large missions from 1972 to 1976. These included large procurement and contracting missions for the U.S. Postal Service and the nations of Saudi Arabia and Jordan and design and construction of a series of technically complex facilities for the National Aeronautics and Space Administration (NASA), the Army Materiel Command, and the Energy Research and Development Administration.

As the division branched out into other activities, it quickly earned a reputation for managing numerous and highly complex project components, specializing in construction of highly technical facilities and procurement of technical equipment. The Headquarters of the Corps of Engineers (HQUSACE) found this capability extremely useful and tasked the division with these additional new missions. Thus, although SAFEGUARD soon ended, the division remained the go-to agency for specialized engineering programs.

End of SAFEGUARD

The May 1972 Strategic Arms Limitation Talks (SALT) II agreement had limited ballistic missile defense (BMD) systems to two geographic locations each for the U.S. and Soviet Union. An additional convention added in 1974 reduced this to one site apiece.

While the Soviet Union chose its BMD system in Moscow,

The Huntsville Center's second mission outside of SAFEGUARD was to support NASA's evolving space shuttle program. *(Photo courtesy of NASA Historical Archives)*

the U.S. Army selected the sites protecting a Minuteman intercontinental ballistic missile field at Grand Forks, North Dakota, where construction was most advanced.

In September 1972 following the signing of the SALT agreement, the division held a system design review on how the treaty impacted the program and division manning, and it immediately curtailed hiring. Despite limitations to the program due to SALT, the division still had much work to do: completion of the Grand Forks site, restoration of the other sites, and continued support of BMD research.

By October 1972, construction was 90 percent complete on the six facilities at Grand Forks: the Perimeter Acquisition Radar (PAR), Missile Site Radar and Control (MSR/MSC), and four Remote Launch Sites (RLS). Next to Grand Forks, the sites at Malmstrom Air Force Base, Montana, were the most advanced, but after the SALT treaty, the Corps had suspended the Phase II construction contract in May 1972 and then negotiated its termination in October.

The following year, the division let two contracts on September 11, 1973, for just over $1 million to restore the site by removing structures and filling in holes, thereby ending the larger program.

On March 26, 1974, because of the reduction of sites, the Department of Defense directed reorganization of the SAFEGUARD program, which it renamed the BMD program. The SAFEGUARD system manager became the BMD program manager. The SAFEGUARD Command became the BMD System Command (BMDSCOM). The Anti-Ballistic Missile Defense Agency (ABMDA) became BMD Advanced Technology Center (BMDATC). This indicated a shift in the program from deployment to reduced operations and continued technology development.

The Army estimated the loss of $481 million from transitioning from multiple sites to a single site, including about $110 million in construction costs, although it was able to repurpose some equipment previously procured for other sites. [2]

Simultaneous with these changes, the construction of the one site drew quickly to a close, and the Army prepared to begin operations.

The SAFEGUARD Command, Grand Forks, stood up in September 1971 with an authorized strength of 784, along with a SAFEGUARD Surveillance Battalion of 401 to manage the PAR. The Army was unable to fill more than half of these slots with trained military personnel and continued to rely mostly on contractors to operate the facilities.

The Huntsville Division awarded a two-year maintenance contract on the facilities on August 4, 1972, which included a training program for these units to assume maintenance. The surveillance battalion occupied the PAR on August 21, 1972. The unit had accepted all support facilities by December and occupied the MSC by January 3, 1973. However, acceptance testing of the RLS was not complete until December 1973 after considerable slippage to correct deficiencies. Even while the division worked to complete equipment procurement and installation, it continued to conduct shock testing and make improvements to equipment hardness.

In October 1973, the SAFEGUARD units conducted the first test of the PAR by successfully tracking a satellite. At the same time, the Omaha District completed the BMD control center in Cheyenne Mountain, Colorado, which fell under the authority of the North American Aerospace Defense Command (NORAD) and Commander-in-Chief Continental Air Defense Command (CICCONAD).

The Grand Forks SAFEGUARD facilities, renamed the Stanley R. Mickelson SAFEGUARD Complex, became fully operational April 1, 1975. The complex was operational for less than a year. The Department of Defense originally planned to maintain the facility indefinitely at a level just under full readiness capable of returning to a fully operational status if an emergency required it.

In late 1975, the House Appropriations Committee argued that this decision reflected "the belief that the effectiveness of the system is so limited as to permit reduced readiness," that the Army would not be able to restore full operations quickly, and that in any case Soviet development of multiple independent reentry vehicles (MIRVs) capable of striking multiple targets made the SAFEGUARD system ineffective. As a result, in the Department of Defense Appropriations Act of 1976 (Public Law or PL 94-212), signed February 9, 1976, Congress authorized expenditure of operation and maintenance funds only on terminating the program. This effectively placed the Mickelson facility in a caretaker status. [3]

Many now consider the SAFEGUARD program, which ran for just under eight years, a total waste of government funding, yet this picture is incomplete. The Army was able to implement and operate the system for a year, from which it gained valuable experience in managing similar systems.

Throughout the period after the SALT treaty until after closure of the facility, BMDSCOM conducted a series of equipment tests and continued to develop and change system components, supported by the Huntsville Division. These tests greatly improved later iterations of BMD systems.

Likewise, the Huntsville Division and the Corps greatly benefited from the experience. From a contracting perspective, the Grand Forks Phase II construction contract had been the largest ever performed by the Corps. Division supply personnel gained experience in procuring large volumes of high-value and highly technical equipment.

From an engineering standpoint, the division was able to greatly advance the use of systems engineering in the Corps. Systems engineering was an engineering approach that considered a composite system of equipment, facilities and personnel over the life cycle of a project.

Since World War II, Bell Labs had pioneered this approach

in its development of missile systems and many engineering companies had adopted the approach in designing complex projects.

Since the division had also used this approach, in 1975 HQUSACE tasked the division to develop regulations and manuals on systems engineering. The division drafted a paper that focused on how to turn operational requirements into design of facilities and industrial plant, touching on such issues as quality assurance, configuration management, training, logistics, maintenance support and scheduling.

The Corps used this approach for other large projects; it formed an important precursor of Lifecycle Project Management, which the Corps adopted in 1988. Thus, the project provided the Corps, and the division specifically, with experience in planning and managing highly technical projects over a long timeframe. This experience helped position the division for several large technical projects in future years. [4]

Col. Lochlin W. Caffey
April 1973 - June 1975

Col. John W. Parish Jr.
June 1973 - October 1975

While the Huntsville Division briefly maintained an office on-site to assist with any remaining issues, it greatly reduced operations after 1973, shutting down area offices and drawing down personnel from more than 850 in 1971 to fewer than 330 in 1973, including reductions from 450 personnel in Huntsville to fewer than 300. The last reductions in force – the last experienced by the division – were complete by 1975.

As the division transitioned away from the SAFEGUARD program, it had to retool its organization considerably. The first major change came in 1973, when the division downgraded the rank of its commander to a colonel. The primary reason for having a general officer commanding the division was to better interact with SAFSCOM.

In 1973, with the departure of Lt. Gen. Alfred Starbird, Division Commander Brig. Gen. Bates C. Burnell moved down the hall to become the BMD Program Manager. This made sense since completion of the project was construction-heavy and required no special missile expertise in systems. Thus, only a colonel was necessary for the Huntsville Division. Col. Lochlin W. Caffey took command of the division in April 1973, and Col. John V. Parrish, Jr., took command in June 1975. Although the slot remained an O7 (brigadier general) position, afterward only an O6 (colonel) held it with a single exception in 1980.

Another change was the addition of an emergency operations planner as a special assistant to the commander. Other divisions had added this position in the mid-196Øs, but it had never been a priority at the Huntsville Division since it had no geographic responsibilities to respond to disasters or civil defense emergencies other than internal responses. Despite this, the division had sent personnel to support some disasters – primarily Hurricane Agnes in 1972 and the "Day of 100 Tornadoes" in 1974.

Hurricane Agnes impacted mostly the Eastern Seaboard from Maryland to New York, but the Corps disaster recovery mission was the largest at that time. Fifty personnel from the division supported the response under authority of the Disaster Relief Act of 1970 (PL 91-606).

The tornadoes of April 3, 1974, greatly impacted Huntsville, killing 11, injuring 40 and destroying 25 buildings on Redstone Arsenal. Although the Mobile District had geographical responsibility for the disaster, the division naturally aided the local community. Most other changes to the division at this time were shifts in the workforce. As SAFEGUARD declined and the division picked up new missions, it required the expertise of more procurement and contracting personnel focused on areas other than missile defense. [5]

Continued cost-efficiency also remained important for the Huntsville Division.

Work for the BMD program, as well as new missions gained in the 1970s, was reimbursable, and the division took numerous steps to reduce overhead to keep customer costs low. Many voluntarily worked an additional half-day a week or minimized travel expenses to keep overhead low. The value engineering program was an important part of this cost reduction.

In 1973, the division achieved cost savings of $1,000 per day; in 1974, the division exceeded value engineering goals by 350 percent. Savings from general management improvement and cost reduction programs exceeded $5 million. A major contributor to these improvements was adoption of the Department of the Army Management Review and Improvement Program (DAMRIP), which the Army initiated in 1973 with the publication of Army Regulation 5-4.

A precursor to Total Quality Management and more recent cost-saving efforts, the program required a continuous cycle of process improvement, adoption of standardized productivity measurements, documentation and reporting, and improvement to business processes.

Alexander Landini of the Office of the Comptroller of the Army introduced the division to the program on April 25, 1974, and the division published initial regulations for the program in fiscal year 1975. [6]

U.S. Postal Service Procurement

The first Huntsville Division mission outside of SAFEGUARD was to support the Postal Modernization Program.

Prior to 1970, the U.S. Post Office had been a cabinet department directly funded by Congress with fragmented management, political patronage, rates not based on market demands, and mostly manual processes. Mail delays were becoming increasingly common. Employees objected to salaries, hours and required labor. In 1970, the largest work stoppage in postal history occurred when 152,000 employees picketed in 671 locations.

A commission created by President Lyndon B. Johnson in 1967 recommended a reform of the postal service, including greater privatization and independence, but Congress did little about the systemic issues until the appointment of Nixon's Postmaster General Winton M. Blount.

A successful businessman, Blount proposed several sweeping changes to the postal program. Largely based on his recommendations, Congress passed the Postal Reorganization Act of 1970 (PL 91-375), which President Richard Nixon signed August 12, 1970. The law established the U.S. Postal Service as an independent service with authorization to set its own rates in order to turn a profit, although the law also provided a revolving fund to supplement its resources when necessary.

Blount launched the new Postal Service July 1, 1971. He established 15 postal regions with regional headquarters and processing centers. Another reform instituted by Blount was the modernization of its mail processing process. The use of mostly manual processes greatly increased the cost of operations. Blount believed automation of the repetitive tasks in handling both preferential and bulk mail was possible through optical character reading of ZIP codes. He introduced a program to rebuild or renovate 21 bulk mail facilities and 12 auxiliary service facilities with modern computerized and electronic sorters by 1975.

The total cost of the program in 1971 was $950 million, but when fully implemented, it would save $500 million per year and reduce cross-country delivery times from 16 to seven days. [7]

Due to the size of the program, the General Services Administration, which normally provided facility services for civilian agencies, was incapable of managing the upgrade on schedule and within budget. Thus, Blount initiated negotiations with the Corps soon after he entered office in 1969.

The Flood Control Act of 1965 (PL 89-298) authorized the Corps to conduct work for others on a reimbursable basis. The Corps completed a dozen individual construction projects for the postal service over the next two years.

In September 1970, the postmaster requested support from the Secretary of the Army, and signed a memorandum of agreement

The Huntsville Division played a major role in the modernization of the U.S. Postal Service overseeing the renovation efforts of 21 bulk mail facilities and 12 auxiliary service facilities with modern computerized and electronic sorters. ***(Photo courtesy of U.S. Postal Service)***

with the Chief of Engineers Lt. Gen. Frederick E. Clarke on March 11, 1971, for the Corps to provide ongoing real estate, design, construction and contracting support to the postal service.

A second memorandum of agreement, signed on May 26, 1971, outlined the scope of the program and established a Postal Construction Support Office headed by Brig. Gen. George A. Rebh, the former deputy commander of the Huntsville Division. The Corps upgraded this office to a directorate the following year.

The postal service maintained control over improvement of the preferential mail facilities, which handled first-class mail and packages, and it assigned the Corps responsibility for designing the bulk mail centers, though a postal service contractor would design the interior of the buildings. The Postal Construction Support Office gave authority to 10 Corps districts to let architect-engineer contracts to design the bulk mail centers.

HQUSACE initially was going to contract procurement for the centers, but after letting contracts for the two largest centers near Chicago and New York, Rebh realized that HQUSACE did not have the resources to keep up this pace and decided to assign the procurement tasks to another division. [8]

Brigadier General Rebh analyzed six divisions for the task, but after deciding to obtain most equipment through government furnished property (GFP) rather than a procurement contract, he selected the Huntsville Division, which he knew from personal experience.

As Rebh attested, "The selection of the Division was based on widespread experience, expertise and splendid reputation earned under the GFP procurement program for SAFEGUARD."

He notified the division of his decision in August 1971 and met with division personnel in October. As this was the first division mission outside of SAFEGUARD, and work on that program was still ongoing, the division had to obtain a new memorandum of agreement from the SAFEGUARD systems manager. This agreement, signed November 22, authorized the division to support the project as long as it did not interfere with completion of SAFEGUARD, personnel supporting SAFEGUARD did not work on the postal service program, and all funding for the new program came from the postal service.

The division added an assistant division engineer for the postal program, as well as a Postal Field Support Branch in its Procurement Division, funded as part of its services. Because this work was for a civilian agency, the division had to establish a civilian financial account. The fact that the division already had robust procurement and contracting divisions meant the current workforce required little augmentation.

Shortly after this agreement, HQUSACE sent an assignment memorandum to the division on November 26. The division would be responsible for procurement and delivery of sorters and other equipment on a tight schedule under HQUSACE oversight. Meeting the schedule was critical to avoid cost increases in the overall upgrade program. Division personnel were to assure the destination and delivery schedules, conduct quality assurance of equipment being shipped, and manage all financing and contracting. HQUSACE formalized these requirements when it published regulations for supporting the postal service on June 4, 1973. [9]

Over the next two years, the division made rapid progress on the program. HQUSACE advertised the first contract for the Chicago bulk mail center at Forest Park, Illinois, November 5, 1971. The division awarded this contract in January 1972 for $2.5 million, which included sorting machines, trays, manuals, spare parts and a maintenance package.

Over the next year, the division prepared 30 bid packages worth a total of $200 million to support equipment installation at 19 bulk mail centers and 12 service centers.

From January to August 1972, it issued awards for sorting equipment, motors and meter rolls, with delivery scheduled from December 1972 to January 1975. By early 1973, the division had issued 30 contracts worth $44 million, had six contracts worth $18 million ready for award, and was preparing nine contracts worth $53 million.

The largest challenge in the project was the schedule. The division was supposed to ensure delivery within a 30-day window for each facility. The division was late on about 1 percent of deliveries as a result of contracting or related issues.

Unofficially, however, few of the deliveries occurred in the original projected timeframe for reasons not involving the division, such as construction date slippages. The most common cause for these delays was the number of design changes that occurred – as with SAFEGUARD, bulk mail facility design occurred simultaneously with construction and procurement.

For the first 18 months of the project, the postal service designer required manufacturers to make an average of 100 changes per month. Twenty-seven percent of designs changed at some point during the project. This resulted in the division making 416 modifications to 55 contracts. Managing these changes became so chaotic, the postal service requested the division assist with updating designs and mailing them to contractors. These numerous changes resulted in cost increases of up to $38 million and delays in completion of bulk mail centers from four to 13 months, pushing projected completion of the overall program into 1976. [10]

Not surprisingly, these changes greatly increased the costs of the upgrade beyond the postal service budget. Congress did not provide additional funding for the program in the 1974 budget, and on February 2, 1973, the Office of Management and Budget directed the Corps to make no more real estate purchases after June 30, 1973, and to end all construction and procurement for the program by June 30, 1974. HQUSACE ordered the division to end all work on the project by October 1, 1974. Total Corps personnel working on the program dropped from 1,600 at the height of the program to 1,200 at the end of fiscal year 1973 to zero at the end

of fiscal year 1974. By the end of 1974, the division had contracted about 95 percent of the funds, valued at $175 million.

A 1973 General Accounting Office (GAO) report on the project generally praised Corps performance in the contracts and found cost increases were due to problems outside of division control.

The Huntsville Division "had adopted a good management approach for the postal GFP procurement. Because of the tight schedules and the massive coordination required, the normal management by exception probably would not have been successful."

By 1976, the GAO estimated that delays in the program had increased costs by up to $47 million. Adding all costs of the facility upgrade program, including retraining employees, the GAO estimated the program costs had grown from $950 million to $1.5 billion, while estimated savings from the upgrade had declined from $500 million to $138 million annually.

Efficiencies gained from the program were uncertain. Parcel processing rates had decreased, delivery time goals remained unmet, and misdirection of and damage to parcels were high, although other metrics did improve. It would take time to obtain the ultimate savings from the program, which the division no longer supported. [11]

Support for NASA

The Huntsville Division's second mission outside of SAFEGUARD was support of NASA's evolving space shuttle program.

Even as NASA prepared to send a man to the moon in early 1969, it also began to plan for the post-Apollo program. President Nixon assigned a Space Task Group to review options for a future space transportation technology. This group published its report in September 1969, which recommended, among other actions, development of "low-cost, flexible, long-lived, highly reliable, operational space systems with a high degree of commonality and reusability."

After NASA and its contractors researched future space vehicles that met this description, the president announced the space shuttle program January 5, 1972, focusing on "a space vehicle that can shuttle repeatedly from Earth to orbit and back."

As he noted, "The Space Shuttle will give us routine access to space by sharply reducing costs in dollars and preparation time."

Although the program was not as cost-effective as advertised, a reusable shuttle was an improvement over the use of large and expensive rockets. NASA established milestones to complete a design for the shuttle by 1974 and conduct test flights by 1977. To achieve this, however, would require rebuilding or modifying many facilities as well as adding new facilities to test new technologies and techniques.

Since the majority of this work was at the George C. Marshall Space Flight Center on Redstone Arsenal near Huntsville, Alabama, or in neighboring Mississippi, it made sense for the Huntsville Division to become involved in upgrading these facilities, which, like SAFEGUARD, involved high technology. Indeed, many division employees who supported SAFEGUARD formerly worked on the Saturn program for the Mobile and Canaveral districts. [12]

The Huntsville Division became involved in informal talks with Marshall Space Flight Center personnel in the spring of 1972, resulting in a formal announcement of the division's participation in the space shuttle program in May.

HQUSACE officially tasked the division in August. The division formed a NASA Project Office under Joe G. Higgs, formerly chief of the Site Development Section in the Engineering Division, and assigned Lt. Col. John J. Cook as special assistant to the commander on NASA activities. Deputy Division Engineer Col. Robert R. Wessels departed the division for the U.S. Army Element, NASA.

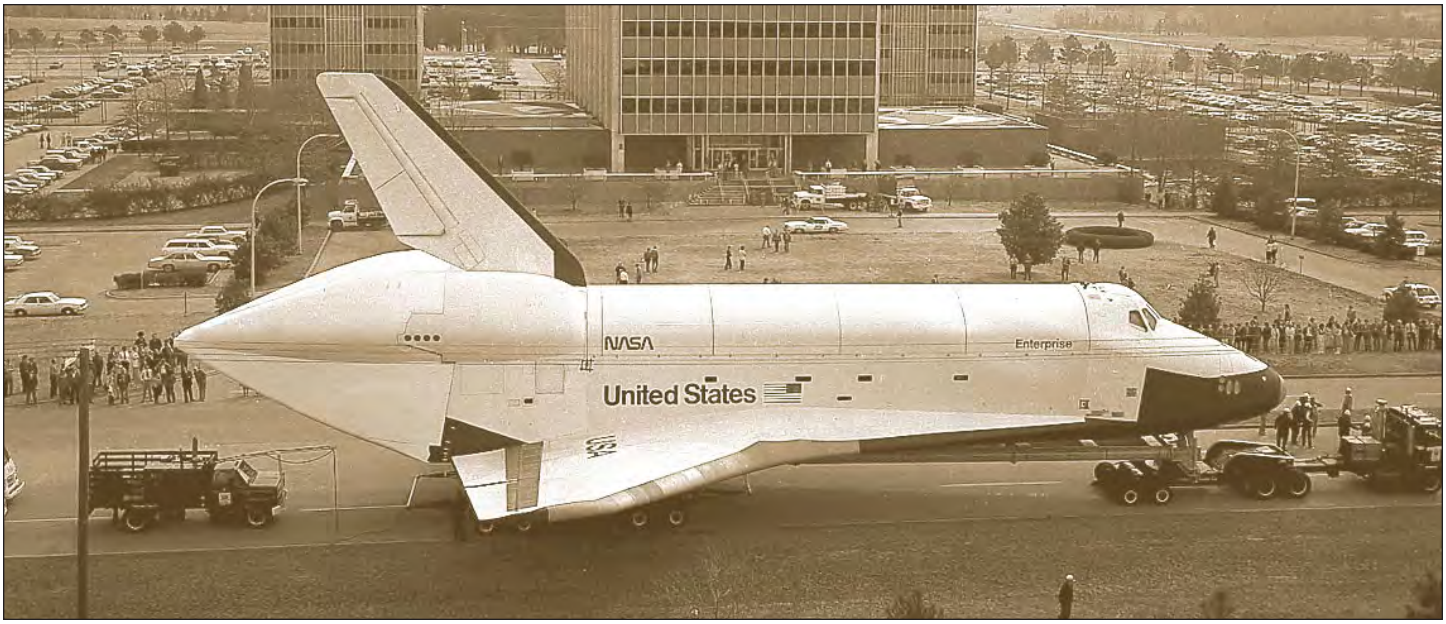
Shortly after announcement of division support, HQUSACE and the SAFEGUARD systems manager signed a memorandum of agreement allowing the division to work on the space shuttle program as an "exception" to the existing agreement. It was the second such agreement in seven months; after President Nixon signed and Congress approved the SALT treaty later that year, the SAFSM and later BMDPM no longer required the division to obtain permission for work outside of SAFEGUARD.

The division would support criteria development, design and construction oversight for space shuttle facilities. NASA would write and advertise architect-engineer contracts and then turn them over to the division to manage. Later, NASA tasked the division to assist with some "in-house" design work. The division would advertise and manage construction contracts, although it accepted the possibility that local districts would probably have responsibility for execution of some construction as they had during SAFEGUARD.

In fact, the work was in many ways similar to SAFEGUARD in that it required contracting of design and construction of complex facilities and procurement of technical equipment across multiple districts, although the funding levels were never as high as SAFEGUARD at its peak. [13]

The mission began in mid-1972 when the Huntsville Division prepared contracts to rebuild the A1 and A2 test stands at the Mississippi Test Facility (later renamed the National Space Technology Laboratory) near Bay St. Louis, Mississippi.

Now part of the John C. Stennis Space Center, prior to 1988 the facility was the primary test site under management of the Marshall Space Flight Center. The two test stands simulated flight and required considerable enlargement and strengthening to support the larger thrust of the solid rocket boosters used to take the shuttle into orbit. The division issued a request for



On January 5, 1972, President Nixon announced the launching of the space shuttle program which was to become Huntsville Division's second mission outside SAFEGUARD. ***(Photo courtesy of NASA)***

proposal for the A1 test stand in August 1972 and awarded a $2.9 million contract in October.

It followed this with preparation and award of a $4.1 million contract for the A2 test stand in June 1973. In addition, in late October 1972, NASA issued and the division managed a $1 million contract to procure and install new liquid oxygen and hydrogen fuel tanks for the test stands. The division then began preparing contracts for modifications of test stand B2.

At the same time, NASA assigned the division responsibility to upgrade the heating, ventilation and air conditioning (HVAC) of the External Tank Test Facility at the Michoud Assembly Facility at Chalmette, Louisiana, about 35 miles southwest of Bay St. Louis.

Because of the projected growth at these two sites, in November 1972, the division established an area office of 26 personnel in Bay St. Louis to oversee work at both sites. Heading this office was John J. Blake, who had formerly managed the Grand Forks area office; most other personnel had also previously worked at Grand Forks or Malmstrom.

Meanwhile, the division assumed management of design contracts and prepared and awarded construction contracts to modify the Acoustic Model Engine Test Facility and Electrical Power Laboratory at the Marshall Space Flight Center. It awarded the two contracts valued at $1.3 million in February 1973. After awarding these contracts, the division established a three-person area office on Redstone Arsenal in May 1973 headed by Everitt Martin. By September 1973, the division was managing six contracts for NASA valued at $11 million: three at Bay St. Louis, one at Michoud, and two on Redstone. [14]

The program continued to expand over the next four years. At the National Space Technology Laboratory, the division issued four additional contracts plus modifications of the existing contracts worth $20 million. The division awarded contracts to modify test stand B2 in two phases for $1.9 million and $7.4 million – the latter being the largest of the NASA contracts.

In addition, the division issued contracts to modify the S-1C Saturn complex as the Orbiter Propulsion System Test Facility, a $2.5 million contract to build the Advanced Dynamic Test Facility, and a contract to build dock facilities on the Pearl River.

At the Marshall Space Flight Center, division-managed contracts quickly grew to $10 million by 1976, including $3.8 million in modifications to the Saturn test stand to support external tank tests, $1.5 million in design and modification of Building 4572 as the Solid Rocket Booster Structural Test Facility, $2.5 million in modifications to the Advanced Dynamic Test Facility, and conversion of Building 4550 as the Ground Vibration Test Facility.

In addition, the division completed several projects not related to the space shuttle program: revising the climate control system in Building 4487; making repairs to Marshall Space Flight Center facilities after the April 3, 1974, tornadoes hit Redstone Arsenal; and construction of the Solar Heating and Cooling Breadboard Test Facility.

The latter was part of an ongoing effort to test technology for capturing solar energy, conducted initially at the Lewis Research Center, Ohio, under the National Science Foundation and later the Energy Research and Development Administration with component testing at various facilities.

In 1975, NASA enlisted the division to assist with design and construction of the facility in a short timeframe. After NASA provided criteria in November, the division completed the design

in-house and let the $647,000 construction contract March 17, 1976.

As with SAFEGUARD, the space shuttle program faced considerable delays and cost increases due to design changes. To save time and money, NASA chose to reconfigure, modify and enlarge Saturn rocket test facilities rather than construct entirely new facilities except when absolutely necessary. These modifications were considerable, and for some facilities took more time than estimated.

The shuttle, like the PAR, was experimental without a previous prototype. This led to numerous design changes, requiring modifications to facility redesigns often after construction had begun. Likewise, changes in test criteria also required design changes.

For example, as the shuttle engine specifications neared finalization, NASA made additional changes in design to the A1 and A2 test stands at the National Space Technology Laboratory in Mississippi to improve the test stand fuel and oxidizer cleanliness, which had proven critical in the functioning of the solid rocket booster. However, most design changes occurred during the program's early years and had more or less tapered off by the time the program ended.

In addition to these challenges, the division elected to use some prefabricated components in modifying the A1 and A2 test stands. Such parts, while they saved time, often required adjustments by shop personnel to fit the existing locations and equipment on the ground. It did not help that NASA was refurbishing facilities in the same general area as new construction, or that multiple contractors were sometimes at work in the same facility at the same time. This also increased costs and schedules.

Nevertheless, the division was able to complete the contracts by April 1977, when NASA accepted the facilities. Two personnel remained in area offices through the end of the year to close out the contracts. [16]

Munitions Production Base Support Construction Program (MPBSCP)

In late 1973, the Huntsville Division picked up its third mission after SAFEGUARD, but unlike the work for the U.S. Postal Service and NASA, division support of munitions production modernization would extend more than two decades.

Before the U.S. entered World War II in 1941, there was widespread recognition that the U.S. was woefully behind Germany and Japan in the size of its military industrial complex.

In mid-1940, the Army Ordnance Corps and Chemical Corps enlisted the Corps of Engineers to build sufficient facilities within an 18-month span to equip and maintain a 2-million-man army at a price of $3.9 billion.

The vast majority of the 34 Army ammunition plants (AAPs) built under the program were complete by the end of 1941 except for two chemical munitions plants that were completed at the end of 1942.

Thus, "when war came to the United States, the new government-owned munitions industry was a reality," wrote historians Lenore Fine and Jesse A. Remington. To conserve construction materials and save time, most factories built during the war used cheaper materials such as wood and asbestos with an estimated five- to 10-year lifespan. Despite these estimates, the lifespan of many of these plants surpassed 25 to 30 years.

This became a severe limitation as troop deployments to Vietnam increased after 1965. The Army suddenly needed more ammunition, including advanced weaponry developed since the Korean War, such as cluster bombs, napalm, phosphorus rounds and high explosives. Several of the older plants required considerable reinvestment to get up and running, and all of the plants were using obsolete equipment and processes that had not been seriously updated since World War II.

Further, safety had become a concern since most of the plants were of wooden construct as opposed to the more conventional mortar or cement used at commercial explosives plants. It became necessary to rapidly expand and improve the U.S. military's munitions production base. [17]

Efforts to modernize the production base started in 1968 under the Army Materiel Command (AMC). The Ordnance Branch of the AMC had started to modernize the Frankford Arsenal, Pennsylvania, as a pilot project, but funding constraints slowed its progress. That year, the AMC presented a plan to the Assistant Secretary of the Army for Installations and Logistics and the Office of the Secretary of Defense to modernize the entire munitions production base.

At that time, there were 19 of 25 still active Army ammunition plants in existence, with a total value of $11 billion.

Scheduled to start in 1970, modernization would take five years and cost $2.4 billion. By 1970, however, based on new studies by Kaiser Engineers, the Logistics Management Institute, and the Joint Panel for a Coordinated Management System for the Department of Defense Ammunition Production Base, the Army had revised its estimates to 12 years at a cost of $4.2 billion, ending in fiscal year 1981.

Between 1970 and 1973, the Army initiated 98 projects for $600 million, ranging from complete renovations to small equipment refurbishment. An Army audit report, completed in May 1973, was critical of the program's slow implementation, which was increasing the cost.

For example, the cost of the Frankford Arsenal revamp had spiraled from $8 million to $27 million despite completion of only one of seven construction modules. AMC had taken several actions to correct these issues, yet the audit identified several problems needing correction. Of the $600 million provided by Congress for the program in 1971, the Army had contracted

only $300 million and expended only $130 million. It planned to contract less than half of the remaining funds by the next year.

AMC had established a project office in December 1972 at Picatinny Arsenal, New Jersey, with Brig. Gen. Robert J. Malley as its project manager. However, this was after a two-year delay, and some projects remained decentralized and not under its control.

While the office had instituted the Mechanized Milestone Reporting System, it still was not being used in January 1973. The audit report argued that the Army needed to enforce discipline, accelerate engineering, strengthen management and use the latest technology in upgrades.

"Engineering seems to be the basic pacing factor for the program," it noted. The report recommended scaling back the program and turning it over to an agency that had the engineering resources to complete it. [18]

In 1973, Chief of Engineers, Lieutenant General Clarke met with Brigadier General Malley and recommended centralized management of the projects under the Huntsville Division. Since the division supported other national programs, including SAFEGUARD, the postal service bulk mail center modernization, and the space shuttle program, it already had many of the needed personnel in place.

Although the Corps did not sign a memorandum with the Munitions Production Base Modernization and Expansion Project Office until 1975, HQUSACE drafted a support plan, notified the division of the impending mission in June, and sent tasking memoranda October 16, November 20 and December 3, 1973.

"The program is very complex because we have 25 facilities spread over the United States either in need of repair, replacement or expansion," Malley said.

By 1975, the office had committed more than $1 billion to the program. The division was to modernize 25 AAPs, including Burlington AAP, New Jersey; Hays and Scranton AAP, Pennsylvania; Ravenna AAP, Ohio; Radford AAP, Virginia; Alabama AAP; Kingsport, Milan and Volunteer AAP, Tennessee; Badger AAP, Wisconsin; Cornhusker AAP, Nebraska; Indiana and Newport AAP, Indiana; Iowa AAP; Joliet AAP, Illinois; Kansas and Sunflower AAP, Kansas; Lake City, Gateway and St. Louis AAP, Missouri; Twin City AAP, Minnesota; Lone Star AAP and Longhorn AAP, Texas; Louisiana AAP; and Riverbank AAP, California. This would involve coordination with six districts and five other divisions.

The Huntsville Division was to manage criteria development, design, construction and procurement to renovate the plants with concrete, steel, and masonry and modernize 595 production lines – both government and contractor-owned – using automated equipment to assemble ammunition.

The focus of the mission was on metal parts plants; propellants and explosives plants; load, assembly and packing plants; and small-arms plants. Small-arms ammunition and artillery shells were the most costly items in the 1975 Army budget at $3.3 billion. Reducing pollution and wastewater during production was also a major goal.

Overseeing the program at the division was Assistant Division Engineer Col. John J. Cook, who also oversaw the NASA program. Maj. Henry C. Watson managed the division project office, which was collocated with the project manager at the Picatinny Arsenal. The division added five project managers in the Engineering Division overseeing work in geographic regions. [19]

Initial work on the program began in early 1974 with criteria development and design of load, assembly and packing plants for 155-mm and 8-inch projectiles at the Lone Star and Kansas AAPs for $24.2 million.

By the end of the year, work began on expanding propellants and explosives plants with contracts for RDX, HMX and TNT plants, and planning started to procure plant equipment packages in 1975. The division worked on literally dozens of contracts during this period, but several stand out for their importance.

Construction of the first modernized AAP started December 18, 1974, for a black powder plant at the Indiana AAP. The division issued the first RDX plant preliminary design contract December 13, 1974; followed by criteria development April 14, 1975; with final site design at an undetermined AAP scheduled for 1977.

RDX and HMX were experimental explosives being used increasingly in most large explosives rather than TNT. In August 1974, the Munitions Production Base Modernization and Expansion Project Office directed the division to design and construct the first entirely new AAP since World War II.

The Mississippi AAP, located near the National Space Technology Laboratory, would assemble M483 rounds. The division issued the preliminary design contract on November 12, 1974; the criteria development contract on April 2, 1975; and the site design contract on March 8, 1976; with construction projected to begin in 1978. The division completed installation of the first computer-operated plant for TNT at the Volunteer AAP on November 8, 1975 and started production on November 25.

Altogether, by June 1975, the division had issued $220 million in construction contracts for more than 100 projects at 18 AAPs. The most costliest projects were found at the Volunteer AAP and Radford AAP at $49 million and $45 million, respectively. Another 338 projects valued at $810 million were in planning or design for 21 AAPs at that time. Of these, the largest number of projects planned was at Radford AAP for $225 million. [20]

By late 1975, however, the Army scaled back the program considerably, primarily because of revised forecasts of ammunition needs after the U.S. had left Vietnam earlier in the year. As a result of these revisions, the AMC decided to close six AAPs and greatly reduce production at eight others. In response, the Munitions Production Base Construction and Expansion Project Office suspended work at six project sites by the end of the year.

The following year, the office issued a new five-year plan based on the revised Department of Defense guidance directing military services to write mobilization plans for a longer conflict in Europe and a shorter conflict in Northeast Asia. This plan dramatically scaled back the size of the program, reducing modernization projects at 23 AAPs to only 12 AAPs, starting with the Indiana and Sunflower AAPs.

The budget, which had reached a peak of more than a billion dollars in 1975, was scaled back to $255.7 million for fiscal year 1977.

Although Congress quibbled over some projects, the GAO comptroller general found all of the larger projects were justified, noting, "The Army has done a good job in planning the ICM [improved conventional munitions] expansion projects."

However, it did suggest phasing the load, assemble and packaging projects, and argued for a stricter project review and approval process for smaller maintenance and support projects.

By September 1976, expansion of the 155 mm and 8-inch lines at the Lone Star and Kansas AAPs were complete. Design or construction of several of the large plants continued into 1977, including the new Mississippi AAP, but there were also numerous small equipment maintenance or refurbishment projects ongoing at the Iowa, Lone Star, Lake City and Louisiana AAPs, which involved about 35 percent of the overall program budget.

Nevertheless, even with this decline in funding, the division continued to support the program at a high level of effort for many more years. [21]

Early Energy Research

In 1974, the Huntsville Division first became involved in energy research through the Energy Research and Development Administration (ERDA). The division was already familiar with some energy issues. Under the SAFEGUARD program it had managed architect-engineer contractors that had researched power requirements and electromagnetic pulse, designed power plants and oversaw generator procurement.

ERDA had the unique mission of researching new energy sources. President Nixon had proposed a department of energy and natural resources in 1971 along with other improvements, but Congress did not act on his recommendations until an Arab oil embargo hit the U.S. in 1973.

In a message to Congress in November 1973, Nixon argued, "We are heading toward the most acute shortages of energy since the Second World War," with reduction in available oil by as much as 17 percent. Unfortunately, Atomic Energy Commission (AEC) rulings on the transportation of nuclear material and technical issues with nuclear processing plants had paralyzed the development of nuclear power plants.

Nixon requested several short-term measures, including authority for the AEC to approve nuclear power plants without a full hearing if it met safety standards.

Long-term, the president proposed creation of ERDA, which would merge the AEC and energy research in five departments, along with approval of a $10 billion budget to research alternative energy sources with a goal to become "energy self-sufficient by 1980." In response, Congress created ERDA in the Energy Reorganization Act of 1974 (PL 93-438). It had 7,200 employees and a $3.6 billion budget.

Shortly thereafter, President Gerald Ford stood up the agency and named Robert C. Seamans of the National Academy of Engineers as its first administrator in 1975. In another series of legislation, including the Federal Nonnuclear Energy Research and Development Act of 1974 (PL 93-577), Solar Heating and Cooling Demonstration Act of 1974 (PL 93-409), Geothermal Energy Research, Development and Demonstration Act of 1974 (PL 93-410), and Solar Energy Research, Development and Demonstration Act of 1974 (PL 93-473), Congress funded and directed research into various forms of alternative energy.

ERDA developed a three-phase research plan. The first phase through 1985 was to develop prototype plants to demonstrate the ability to commercialize advanced alternative energy sources, including conversion of coal to clean liquids and gases. Although by 1976, Congress had reduced ERDA's research budget by $6 billion, research in fossil fuels actually increased from $76 million in 1974 to $442 million in 1977. It was in this area on which ERDA focused. [22]

The Huntsville Division supported development of several fossil fuel demonstration plants. The earliest and most advanced of these projects was a clean coal conversion plant that sought to demonstrate a commercialized process to turn high-sulfur bituminous coal into gaseous and liquid fuels through hydro-carbonization.

Finding a way to use coal to replace gas and oil without the high transportation and environmental costs normally associated with coal would enable the nation to avoid cost increases resulting from the oil embargo. The Office of Coal Research in the Department of the Interior, which later became part of ERDA, initiated the project. The office entered into informal discussions with the division in April 1974.

Following an April 30 office call between Division Commander Colonel Caffey and Barney Trawicky, the civilian chief of engineering, the division began to work with the office to help draft a request for proposal to develop a clean coal demonstration plant. The division projected a growth of personnel supporting the program from 16 in 1975 to a maximum of 35 in 1976 funded at $1.2 million.

Secretary of the Interior Rogers C.B. Morton officially requested Corps support from Secretary of Defense James R. Schlesinger exactly one month later. Although Schlesinger

approved the relationship June 18, and the Corps drafted a memorandum of understanding in August, the agreement remained unsigned until March 1975 after the formation of ERDA in January and approval by the Office of Management and Budget.

Under this agreement, the division would provide technical and engineering assistance; prepare and review plans and specifications, bid proposal packages and cost estimates for design and construction projects; help evaluate proposals; and then help manage and provide quality control on construction. However, HQUSACE started tasking the division to support the Office of Coal Research immediately after receiving Department of Defense approval. [23]

The division's first task was to evaluate concept proposals for a clean boiler fuel demonstration plant that could convert high-sulfur coal to low-sulfur ("clean") fuel suitable for firing a boiler in accordance with Environmental Protection Agency regulations.

The requirement to commercialize the technology was to process 2,600 tons of coal per day and produce 3,900 barrels of liquid fuel and 22 million cubic feet of gas fuel. There would be four phases to the effort over eight years: concept engineering and demonstration plant engineering, both at full federal funding; construction and acceptance at 50 percent federal funding; and demonstration plant operation at 50 percent federal funding, followed by a buy-out of the government interest after successful demonstration.

Phillip White, ERDA assistant administrator for fossil fuels research, testified before Congress, "The objective…is to translate research and development results into technology that can be transferred to the private sector for use in commercial operations." Once the demonstration plant was operational, the plants could "be scaled up to full commercial size with normal risk."

In other words, his intent was to attract a commercial venture that would partly fund and later fully assume all plant costs to keep it in private hands.

The Office of Coal Research issued the request for proposal at the end of June 1974 with submittals due by September 25. The source selection board, which met for roughly four weeks, included eight personnel from the division's engineering and construction staff. Only two companies submitted proposals, and one of these did not accept the cost-sharing requirements in the request for proposal, disqualifying the vendor.

On January 17, 1975, the Office of Coal Research awarded the $237 million contract to Coalcon, Ltd., a joint venture of Union Carbide and Chemical Construction Corporation (Chemico). Two days later, the office and contract transferred to ERDA. Over the next year, the division also assisted with procuring $10 million in equipment for the plant and assisting with site selection. [24] Despite this seemingly propitious start to the clean boiler fuel demonstration plant, the pilot project was unsuccessful.

In 1977, the GAO reviewed the project and argued that there were both technical and management reasons for this failure. In the hydro-carbonization process, Coalcon crushed the coal to particulate size and then heated and pressurized it in a reactor. The coal reacted with hydrogen gas to form hydrocarbons. Burning the residue in a gasifier produced hydrogen and steam. Filters removed sulfur, ammonia and other impurities, producing gases such as butane and propane. The cooling gases condensed liquid fuel useable in boilers. The technical problem was that, because of the use of high-sulfur coal, sulfur eventually clogged the filters in the pilot project, preventing production of the fuel.

ERDA was aware of this problem, but the contractor never developed a test bed to resolve the issue, leading another contractor to report, "The technical foundation for the … project appears to be seriously deficient."

Further, the GAO believed ERDA did not closely manage the contract by requiring milestones and decision points and failed to take timely action, although it did task the division to provide technical support to the contractor in June 1975.

On top of these issues, Chemico dropped out of the joint venture in September 1976 leaving Union Carbide as the sole contractor, a settlement that ERDA believed did not impact the project but which likely caused some delays. In the end, the issues resulted in a $10 million cost overrun and a 14-month delay in completion of the concept engineering, which resulted in termination of the contract on June 15, 1977. At the time of contract termination, ERDA had selected a site for the plant, but the division had not initiated real estate proceedings. [25]

The division supported several other energy projects. On March 6, 1975, ERDA requested division assistance to prepare requests for proposal for a pipeline gas demonstration plant, which would convert bituminous coal to high-BTU gas useable in pipelines for industrial or residential use.

The division helped prepare requests for proposals for two gasification plants in October 1975 with a separate effort to develop the gasifier, the most critical component of the proposed system. Unlike with the clean boiler plant, division personnel did not sit on the source selection board but did provide cost estimates.

ERDA selected Illinois Coal Gasification Group and CONOCO Coal Development Company to design and build the two plants. Another project involved development of a fuel gas demonstration plant, which would convert high-sulfur gas to low-BTU gas focusing on utility, industrial and small-scale consumption. The division helped prepare the request for proposal, which ERDA issued in January 1976. ERDA received 15 proposals by May and with division support had completed their evaluation by October. Still by the end of the year, it had not yet finalized its selection. Changes in requirements, clarifications and re-submittals delayed award implementation until 1977.

As noted previously, the division also supported the solar heating and test facility at the NASA Marshall Space Flight

Center, which ERDA had assigned as technical manager of the solar energy program authorized by Congress in 1974. Although the division had made progress in supporting ERDA with development of alternative energy prototypes, by 1977 most of the projects were on hold.

That year, President Jimmy Carter had initiated reorganization of federal energy programs through the creation of the Department of Energy. Although ERDA served an important function in promoting energy research, it proved a transitional agency. The Department of Energy would conduct all future energy research. [26]

Middle Eastern Missions

Two of the most unusual missions the Huntsville Division assumed after SAFEGUARD were large contracting and procurement missions for the nations of Jordan and Saudi Arabia. Support of Jordan originated with its interest in building a tank assembly plant, a move supported by the Joint Chiefs of Staff to establish a maintenance shop serving the Middle East.

The Jordanian Armed Forces had inspected a U.S. M48 Tank plant at Anniston, Alabama, in 1972, and desired to implement its own plant using similar assembly-line procedures. Though the Israeli Yom Kippur War of 1973 interrupted these plans, Jordan revived the project in 1974 through the U.S. Military Assistance Program, which Congress established in 1961 to aid allied military forces, and was funded through a Foreign Military Sales case. Since the project involved more procurement and construction capabilities than logistics or hardware sales, the Army brought in the Corps of Engineers to support the request.

The Corps' Mediterranean Division, which at the time was responsible for military construction from Italy to Saudi Arabia, completed field studies in March 1975 and signed the agreement for a Foreign Military Sales case in April. Since it relied primarily on local contractors, the division requested assistance coordinating with U.S. companies to procure shop equipment and to contract design firms, estimated at around $100 million. HQUSACE selected the Huntsville Division to support the project because of its extensive procurement and contracting experience.

The project initially made rapid progress. The Huntsville Division issued the request for proposal for criteria development April 30, 1975, and the Jordanian Armed Forces selected the architect-engineer firm based on Huntsville Division input in September, with award of the contract in October.

In November, division engineers and the contractor met with Jordanian military representatives to decide on various design options. Based on these discussions, the contractor prepared the criteria.

In June 1976, the division forwarded to Jordan the request for proposal for the design contract, including equipment specifications, which it estimated at $3 million with a projected construction cost of $109 million.

Evidently, however, there was some misunderstanding about Jordan's price range, and the division began to see indications of Jordanian dissatisfaction. The division eventually called a conference in Washington, D.C., with Jordanian representatives in August. There, Jordanian General Abdul-Haddie al-Majali requested a much smaller facility with an output 30 to 40 percent lower than the initial criteria. Over the next months, the contractor proposed several criteria with estimated construction costs ranging from $50 million to $65 million.

In December, Jordanian personnel threw the division another curve by substantially revising the purpose of the plant to depot-level maintenance and rebuilding of the British Centurion Tank, making M48 Tank maintenance secondary. The projected date for award of the design contract slipped to February 1977, but it ended up taking substantially longer. [27]

In Saudi Arabia, the Huntsville Division's mission focused solely on procurement. The Corps of Engineers had supported Saudi Arabia with various infrastructure projects since 1965 through the Saudi Arabia District of the Mediterranean Division. This was primarily support for the U.S. Military Training Mission, in which U.S. forces supplied and helped train allies in the use of military equipment. The level of support increased dramatically after 1970, eventually resulting in the creation of a Middle East Division in 1976 with headquarters in Riyadh, Saudi Arabia; districts in Riyadh, Al Batin and Jiddah; and a rear detachment of 400 in Virginia.

The same year, the Corps signed a memorandum of understanding with the Saudi Ministry of Defense and Aviation to help build three bases, two headquarters, a military academy and other infrastructure. Funded by the Saudis, the largest of these projects was construction of King Khalid Military City, a base of 70,000 military personnel located 400 kilometers north of Riyadh and about a mile from the Kuwaiti border. Estimated cost of the base was $8.5 billion, which the Saudis would pay for using a Foreign Military Sales case. [28]

Although the Middle East Division managed the design and construction projects, Chief of Engineers Lt. Gen. William C. Gribble Jr., brought in the Huntsville Division in January 1976 to support procurement for the project. Once again, this assignment was based mostly on the reputation the division had obtained through the SAFEGUARD and Postal Service projects.

The division signed a memorandum of understanding with the Saudi Arabia District in March 1976, which it revised in July after formation of the Middle East Division. However, Huntsville Division personnel worked mostly with the Rear Detachment of the Middle East Division. Although the dollar value of the goods procured was never as high as with previous missions, the total volume was and this required additional reorganization of the Huntsville Division Procurement Division in 1976.

Most of the items required during the first nine months of the effort were for "life support," primarily household goods such as furniture, appliances, etc. Later, the focus of the effort shifted to construction supplies and dental equipment. There was also a demand for computer and network equipment, which the Huntsville Division Automated Data Processing Center managed. Through early 1977, total value of the items procured was less than $10 million. [29]

The period of 1972 to 1977 had been years of transition for the Huntsville Division. "With SAFEGUARD facility construction rapidly reducing in volume, the Huntsville Division's other missions of procurement of government-furnished property for … the postal service's modernization program, the NASA Space Shuttle Construction Program, and the Munitions Production Base Support Construction Program (MPBSCP) loom ever larger in the future planning of the Division," the Information Bulletin observed in 1974.

The division would soon after add to this mix the construction of ERDA demonstration plants and two construction and procurement missions for Middle Eastern nations. The division gradually decreased its involvement in SAFEGUARD and increased funding and personnel involved in other projects until the majority of its employees worked on the many non-ballistic missile defense missions.

Thus, by the end of 1976, the division managed a grab-bag of diverse and seemingly unrelated projects. Unlike most Corps districts or divisions, the projects were not based on geography, watersheds, or the location of agency headquarters.

It remained "an operating division without subordinate districts or geographical areas of responsibilities," but "its missions took it worldwide," historian Louise S. Heidish observed. What these missions had in common was their complexity, geographic dispersion and technical requirements, including specialized expertise not ordinarily maintained by most Corps civil works districts.

These projects met the needs of many other military and civilian agencies on a reimbursable basis. Assignment of projects based on technical expertise rather than geographic area would ever after mark the Huntsville Division's mission. [30]

The question remained what the Huntsville Division's future mission would be. Would the division continue to serve primarily as an organization to execute technically difficult missions of temporary duration and character, or would HQUSACE assign the division new and lasting programs and what would these programs entail?

While the division had already picked up several new projects from 1972 to 1976, HQUSACE would largely settle this question over the next five years by assigning a fixed mission set.

What was clear by 1977 was that the division continued to deliver value to the Corps and to the nation through its unique missions outside of SAFEGUARD. It had outgrown its original mission as that mission declined, though it continued to support ballistic missile defense to a smaller degree. It was now ready to move on to larger and greater projects and programs.

End Notes for Chapter 2

[1] HND *Info. Bull.* (Apr. 18, 1975): 1 (Kitchens Notes).

[2] HND-PAO, *Huntsville Division Historical Summary FY 1972* (Huntsville: HND, 1973): 2; HND *Info. Bull.* (Jan. 14, 1972): 1-2; (Aug. 25, 1972): 2; (Aug. 24, 1973): 3; (Sept. 21, 1973): 3; (Jun. 14, 1974): 5; Let. Compt. Gen. to Rep. Les Aspin, May 21, 1974 (HNC Elect. Files); webpage, Sharon Watkins Long, "SMDC History: SAFEGUARD to BMD," Mar. 25, 2015 (https://www.army.mil/article/145270/SMDC_History__ Safeguard_to_BMD/, May 31, 2016).

[3] HND *Info. Bull.* (Aug. 25, 1972): 1-2; (Jan. 24, 1973): 1; (Oct. 15, 1973): 2; (Dec. 14, 1973): 2; (Apr. 12, 1974): 1-2; (Apr. 18, 1975): 1-2; U.S. Cong., *Department of Defense Appropriations Bill*, 1976, H.Rpt.517 (94th Cong., 1st Sess.): 111, 270-271.

[4] GAO, "U.S. General Accounting Office Staff Paper: the SAFEGUARD Ballistic Missile Defense System" (N.P: DA, 1973): passim (HNC Elect. Files); Paper, HND, "Systems Engineering (SE) Requirements for Program Development Planning and CE SE Procedures Documentation on Complex Projects of Facility, Plant, or Equipment," Jul. 1, 1975 (U.S. Army Corps of Engineers Engineering Support Center, Huntsville [HNC] Archives, Huntsville, Ala.)

[5] Kitchens, *History of HND*, 104, 130; HND Info. Bull. (9 Aug. 1972): 1-4; Manders and Leland Johnson, "Continuous Emergency Operations, U.S. Army Corps of Engineers Disaster Relief Operations, 1950-1979," manuscript (CEHO Archives): 215-222, 242-44; Interview, Charles Ford, by Damon Manders, Jan. 4, 2017; Interview, John Matthews, by Damon Manders, Jan. 12, 2017; Org. Chart, 1 Feb. 1978 (HND Archives). The exception to the O6 commanders was Brig. Gen. Max W. Noah, who was promoted during his brief tenure from 1979 to 1980; see Louise S. Heidish, *A History of the Huntsville Division, U.S. Army Corps of Engineers, 1977-1981 Update* (Huntsville: HND, 1982): 3-8. On personnel numbers, compare HND-PAO, *Hist. Sum. FY 1972-1974*, 1-2.

[6] Interview with Matthews; HND-PAO, *Hist. Sum., FY 1974*, 11-13, 21; compare AR 5-4, *Department of the Army Management Review and Improvement Program* (Wash., D.C.: HQDA, Sept. 1973) and *Department of the Army Process Improvement Program* (Wash., D.C.: HQDA, 1 Aug. 1982).

[7] USPS, *The United States Postal Service: An American History, 1775-2002* (N.P.: USPS, 2003): 34-41; U.S. Cong., Postal Reorganization Act of 1970, PL 375 (91st Cong., 2d Sess.); Let. Comptroller General to Rep. Thaddeus J. Dulski, Jul. 19, 1973 (HNC Elect. Files); HND *Info. Bull.* (Sept. 22, 1972): 1-2; Kitchens, *History of HND*, 114-115.

[8] Let. Comp. Gen. to Dulski, Jul. 19, 1973, and encl.; Kitchens, *History of HND*, 115-117.

[9] Quote from HND *Info. Bull.* (Oct. 15, 1971): 3; Kitchens, *History of HND*, 117-118; HND-PAO, *Hist. Sum. FY 1972*, 6, 59-74.

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3

Refocusing the Mission, 1977-1982

In late 1976, the new Chief of Engineers, Lt. Gen. John W. Morris, requested a study on the future role of the Huntsville Division within the U.S. Army Corps of Engineers. Earlier in the year, Congress had terminated the SAFEGUARD program by placing the facilities in caretaker status.

Since 1972, the division had supported a series of seemingly unrelated projects for the U.S. Postal Service, the National Aeronautics and Space Administration, the Army Materiel Command, the Energy Research and Development Administration, and the nations of Jordan and Saudi Arabia. However, several of these projects quickly ended. The division was once more in a position where, without an influx of new work, it would have to downsize or face elimination.

Col. Dale E. Dobson
October 1977 - October 1979

Submitted in November 4, 1977, the report urged ongoing support for ballistic missile defense, munitions production base construction, energy research and procurement missions for allied nations. It also recommended transferring several programs from the Headquarters of the Corps of Engineers (HQUSACE) to the division in an effort to transfer activities out of the capital region so the headquarters could focus on policy and guidance.

Among the programs transferred in 1978 were the Army Facilities Components Systems, Guide Specification Maintenance, Construction Evaluation Program, Army Pollution Abatement Program, maintenance of computer-aided engineering and architectural design systems, and Corps of Engineers training management. The division also picked up several new procurement missions and programs related to facility modernization and energy management. Within five years, the division's mission set had doubled. [1]

With the reassignment of these new missions, by the early 1980s the Huntsville Division had begun to refocus its expertise on several emerging areas, even as it continued to support missile defense at a smaller level of funding. These missions primarily included facilities improvement and modernization, energy research and conservation, procurement, pollution abatement, maintenance of information systems and training.

HQUSACE assigned the division these missions based largely on its performance under the SAFEGUARD, Bulk Mail Modernization Program, Munitions Production Base Support Construction Program, and support of the energy research over the previous decade. Several of the programs were critical to the function of the Corps, including updating guide specifications, construction evaluation and training, which enabled Corps professionals to successfully design and build Army facilities. Others, such as energy conservation and environmental protection, were new but increasingly important functions within the Corps.

By 1982, these mission sets were the established programs the division supported on a routine basis.

Missile Defense Research

Although the SAFEGUARD program had ended, the Huntsville Division continued to support missile defense programs at a much smaller rate.

The division officially handed over responsibility for all remaining SAFEGUARD elements to the U.S. Air Force in October 1977. Despite this, Division Commander Col. John V. Parish and his successor Col. Dale E. Dobson continued to report to the Ballistic Missile Defense Advanced Technology Center (BMDATC).

The division's primary work during this time was ongoing experiments with hardness, analysis of BMD subsystems, and assistance in 1978 with evaluating proposals to test the Homing Overlay Experiment, which was a new technology to detect, discriminate and intercept intercontinental ballistic missiles (ICBMs). The level of funding for these efforts remained under $1 million per year.

Unfortunately, this was not enough to maintain sufficient expertise in missile technology to manage a large program – with the notable exception of Charles Huang of the Advanced Technology Section and a few others, most of the original employees who oversaw the missile program had moved on or retired after 1976. As a result, division strength had started once again to decline, reaching 311 in 1978. Several other organizational changes resulted.

Since the division was rarely involved directly in construction projects, the Construction Division became the Construction Evaluation and Management Division.

By 1981, the Systems Engineering and Research Branch of the Engineering Division had become the Systems Engineering Division, focused on planning large-scale engineering projects. The division also established organizations to manage its larger missions, but of these the Training Management Division was the largest and longest lasting. [2]

In 1979, BMD gained in importance once again.

On January 4, 1979, BMD Commander Maj. Gen. Stewart C. Meyer briefed Maj. Gens. Bates Burnell and William Wray at HQUSACE of a "projected serious vulnerability" of the Minuteman ICBM system. There had been serious concerns about conversion of the Soviet SS-16 intermediate range missile into an ICBM, as well as the lack of treaty limitations on multiple independent reentry vehicles (MIRVs), which could strike multiple targets from a single missile.

In response, the Department of Defense called for a new BMD system that required fewer missiles and simpler targeting. The resulting concept was called the Low Altitude Defense (LoAD) system, which included a radar data processing center and smaller missiles armed with nuclear weapons.

Incoming BMD Commander Maj. Gen. Grayson Tate briefed Huntsville Division personnel on LoAD in April 1980. Since the Strategic Arms Reduction Talks (SALT) Treaty limited BMD systems, the U.S. could not deploy the system without withdrawing from or altering the treaty. However, it could continue the research. This would require new facilities at the White Sands Missile Range, New Mexico, to test subcomponents and a prototype demonstration facility on Kwajalein Atoll in the Pacific.

New facilities such as at the White Sands Missile Range, New Mexico, allowed the U.S. to continue research on BMD systems without withdrawing from or altering the SALT treaty.
(Huntsville Center Historical Archives)

The division started criteria development, doing about half the work in-house, and continued supporting research of hardening, nuclear weapons effects and protection from electromagnetic pulse, but funding remained low.

Although never approved by the Senate, the SALT II Treaty signed in June 1979 had alleviated the immediate threat by limiting MIRVs and requiring inspections of SS-16s and other land-based missile systems.

Nevertheless, the defense department scheduled continued development of LoAD at a level of $1 billion over eight years, most of which went to technology development and not construction.

By 1982, division funding had increased to $6.5 million to assist planning deployment of LoAD in support of the new Missile Experimental (MX) ICBM with the intent of deploying the system to 23 MX sites. By the following year, the division had contracted $27.4 million to design the test facilities. [3]

The division also became involved in MX deployment. To counter Soviet MIRVs, the Air Force had started development of a more accurate missile with a larger MIRV capability than the Minuteman. Initial plans called for using existing silos to house and launch the MX. The lack of a BMD, however, increased the threat to the system.

In June 1979, President Jimmy Carter announced support for a mobile protective shelter plan. This plan used horizontal instead of vertical shelters and launch tubes. However, there would only be 200 missiles placed strategically among 4,600 shelters, which required the Soviets to destroy all silos to negate the possibility of counterattack. In addition, the plan used transporter-erector-launcher (TEL) vehicles accompanied by mobile surveillance shields to move the missiles from place to place, while still allowing a launch capability on the move. It was a shell game designed to hide the missiles without the need for a BMD. The defense department estimated the program would cost $34 billion through 2000, although the 1980 budget was only $700 million.

Since the MX project office was in California, HQUSACE tasked the South Pacific Division with developing a management plan for construction of the system, which fell initially to the Ballistic Missile Construction Office of the Los Angeles District.

In August 1979, South Pacific Division Engineer Brig. Gen. N.G. Delbridge Jr. contacted Huntsville Division Engineer Colonel Dobson in an attempt to leverage its BMD experience. The Huntsville Division response outlined its history with SAFEGUARD and recommended "a strong CE organization" to manage the program. At the South Pacific Division's request, the Huntsville Division assigned Jerry Mullinix, who had 10 years of experience with SAFEGUARD, as its project manager.

On September 4, 1980, the two divisions signed a memorandum of understanding in which the Huntsville Division would support systems engineering, guide specifications, hardening, procurement, training and management information systems. The Chief of Engineers subsequently stood up the Corps of Engineers MX Program Agency at Norton Air Force Base, California.

The Huntsville Division signed a new memorandum of understanding March 9, 1981, and assigned R.E. Riffel as a full-time liaison at Norton. The division awarded the first of

two contracts for preparation of a design manual in November 1980. "Participation in the MX program will be beneficial … in identifying and resolving potential LoAD/MX interface problems," added Col. John Poteat Jr., division engineer at the time. [4]

On October 2, 1981, after a lengthy review of the MX program, President Ronald Reagan announced major changes to the program approved by Carter. Reagan rejected the mobile protective shelter plan, which he mocked as "racetrack shelters," largely due to the inaccuracy of launches from the TEL vehicle and continued vulnerability of the missiles to the growing Soviet stockpile.

"We will not deploy 200 missiles in 4,600 holes, nor will we deploy 100 missiles in 1,000 holes," he said. Instead, he argued for taking the interim measure of deploying a small number of MX missiles as soon as possible to stationary Titan silos, hardened to 5,000 pounds per square inch (compared to only 2,000 psi at the time) to survive nuclear explosions.

At the same time, he pursued several long-term options for missile bases, including the addition of a smaller BMD system such as LoAD, which would increase survivability.

Finally, he argued for diversification of the nuclear force by strengthening the nuclear triad: B1 bomber and Trident submarine nuclear fleets in addition to ground-based systems. This decision ended Huntsville Division involvement in the MX and the mobile protective structure program, and with MX Program Agency approval, phased out its support other than contractual obligations and completion of information systems. This did not, however, end support of LoAD or later BMD systems. [5]

Facilities Improvement and Modernization

Another of the ongoing missions of the Huntsville Division was the Munitions Production Base Support Construction Program (MPBSCP), which involved modernizing multiple Army ammunition plants (AAPs) throughout the nation. The division was responsible for assisting with contracting criteria development, design, equipment procurement and facility construction.

Originating in late 1973, the program remained the largest division mission, accounting for between a third and a half of division funding from 1977 to 1981. Estimates in 1982 projected the Army would spend $3.75 billion on the program through 1997.

Concerns over spiraling costs, prompted Congress to closely monitor MPBSCP spending. It requested a General Accounting Office analysis in September 1980 of the fiscal year 1982 budget, which demonstrated that more than 10 percent of project spending requested that year ($15.3 million of $125.5 million) was not justified or was premature. Nevertheless, spending on modernization remained fairly consistent over the next four years.

Division support declined only slightly, but "still occupies the center stage," one report noted. To manage the program, the division had established three area offices at Picatinny Arsenal, New Jersey, to coordinate with the project management office; at Rock Island Arsenal, Illinois, to coordinate with the Armaments Materiel Readiness Command (ARCOM); and at Picayune, Mississippi, to oversee construction of the Mississippi AAP, the largest project under MPBSCP. [6]

The division made progress on several MPBSCP projects. The Mississippi AAP project had proceeded to construction in December 1977 when the division issued the $2 million Phase 1A construction contract to clear the site for the new AAP.

The Huntsville Division issued the contract, but the Mobile District would oversee construction since the facility was within its boundaries. The Mississippi AAP was to be a multi-facility complex consisting of 14 buildings over 7,100 acres, including a waste treatment facility as well as warehouses and the assembly facility. The overall construction authorization for the plant was $181 million over four years, and by fiscal year 1982 the division had committed $158.1 million, leaving just over $26 million to complete the project.

The Sunflower AAP, Kansas, also proceeded in 1977, when the division awarded a $14.7 million turn-key contract for design, construction and demonstration of a sulfuric acid concentration plant to process acid byproducts of munitions manufacture. The division issued $97 million in additional contracts through 1979 under oversight of the Kansas City District.

In September 1979, the division issued a design contract for the Radford AAP, Virginia, which provided for four automated production lines for propellants in multiple buildings with a total of 99,000 square feet. The division held the 100 percent design review meeting in September 1979 – design changes resulting from value engineering saved $4 million on the cost of the project. It issued the $62 million construction contract in 1980 and an additional $25 million in other contracts through the end of 1981, which the Norfolk District managed after the division award.

In 1979, the division also awarded a contract to complete a feasibility study for a solar-powered facility at the Lone Star AAP, Texas, although future funding of the project was doubtful.

Other projects included addition of six new TNT lines at the Volunteer AAP, Tennessee, and $60 million in projects at the AAPs in Indiana, Iowa, Louisiana and Milan, Tennessee. This was in addition to 26 other projects under design in 1981 with a total value of $172.9 million. [7]

On June 6, 1978, HQUSACE transferred management of the Army Facilities Component Systems (AFCS) to the Huntsville Division. Formerly managed by the Facilities Engineering Support Agency at HQUSACE, the program was among those reassigned to the division to move programs out of headquarters.

The division signed a memorandum of understanding with

the Army Materiel Command November 20, 1978, updated August 31, 1979.

During World War II and the Korean War, inventory errors caused by an inability to track hundreds of subcomponents had led to shortages of construction materials and parts needed for base construction.

The AFCS originated in 1951 to provide 4,100 pre-engineered facilities with ready-made components and bills of material. This allowed easier planning and materials ordering and sped construction of needed Army facilities. The AFCS included designs for components and subcomponents of camps, hospitals, bridges, ports, gas stations, ammunition dumps, and most other facilities and installations used by the Army. The system included designs and documentation such as pre-created guides, drawings, forms, and bills of material, each maintained in technical manuals (TMs) and electronic databases. Funding for the program came from both maintenance and military construction accounts.

Maj. Gen. Max W. Noah
October 1979 - September 1980

The division's primary responsibility was to update TM 5-301 to 5-305 to make them more reliable. Because of the constant changes in the costs of line items, maintaining the manuals required close management through quarterly review conferences. The division published Change 2 to the manuals in 1979 and Change 3 in 1980, which updated 960 drawings, 3,350 pages of material and numbering. Change 3 also introduced 10 new designs; the division would complete six to eight new designs per year starting in 1981. These designs focused mostly on newer lighter-weight materials and quickly erectable structures to support initial operations in a region.

In 1981, the Army Troop Support and Aviation Materiel Readiness Command tested the AFCS, including actual construction of a hospital, which resulted in redesigns of several components over the next year, including airfields, ports, and troop camps. [8]

A second program that HQUSACE transferred to the Huntsville Division in 1978 was to revise and maintain guide specifications. Guide specifications were a critical part of Army construction. Technical manuals provided guidance on design of many types of Army facilities to provide maximum safety and promote construction uniformity and industry compatibility. Guidance included factors such as quality of foundation, location of utilities or power lines, and strength of construction materials. Most manuals included standard designs and drawings, including design guides. The division started work on the program in 1979 with revision of the real property maintenance activities guide specifications, which required updating 282 handbooks. It nevertheless completed the updates the same year.

The division also supported the Department of Defense in editing tri-service family housing guides, which it did through a combination of contractor and in-house design. It continued this work into 1981. The program required the division to update guides every three years, and the division had let 16 criteria development contracts by the end of 1981.

By this point, the division was also providing guidance for mobilization designs ("M" designs). A major mobilization exercise in 1979 – NIFTY NUGGET – had revealed poor preparation by the Army for potential mobilization for war in Europe.

To address these issues, the Corps began preparing mobilization plans for every military installation in the country with a goal of fielding 10 divisions within 10 days of receiving a mobilization order. Since this process would require construction of hundreds of new facilities, the division began preparing guide specifications to assist districts in developing these plans.

A related program transferred to the division at the same time as the guide specifications was responsibility for the design and evaluation program. Traditionally, HQUSACE had performed three inspections during Army construction: technical evaluation inspections confirmed design adequacy and adherence to Corps guidance, post-completion inspections held six months after occupancy reviewed problems with construction and function, and design criteria inspections three years after construction gathered feedback on guidance and design criteria. Inspection teams included multidiscipline personnel who visited each site. The division made a number of changes to improve the quality of inspections and was quick to point out that inspections would help feed updates to the guide specifications program. [9]

The Huntsville Division also became involved in several projects related to modernization of Army installations.

In 1979, HQUSACE offered Corps assistance to the U.S. Forces Command (FORSCOM) with modernizing facilities to support the changing force structure, primarily facilities for the development, training and fielding of new weapon systems. FORSCOM had identified 400 new weapon systems or force structure changes to be introduced over 10 years, of which it considered 70 critical. Because of the division's experience with missile facilities, HQUSACE initially tasked the division to assist with requirements definition for facilities for the Pershing, Patriot, Roland and MLRS missile systems. It sent the initial tasking memorandum March 18, 1980, with a follow-on memorandum July 18 requesting a management plan to support 10 systems, for which it provided $210,000 in funding.

The division submitted the management plan in August 1980. To determine facility requirements, the division developed facility support plans for each weapon system, which were to include not only operational requirements but also maintenance and training.

At the request of FORSCOM, the division completed facility support plans for six additional missile systems by June 1981: the Hellfire, AAH, DIVAD, RPV, AHIP and Stinger missiles. It also completed the plan for a field artillery ammunition support vehicle.

Next, FORSCOM requested help with preparing facility plans for 86 new armored battalions for 12 combat electronic warfare intelligence units, and to support maintenance for the new M1 tank. The division had completed all of this work by 1982. [10]

The division picked up two other missions involving FORSCOM in 1981.

In August, HQUSACE tasked the division to support FORSCOM with improving railroads on major installations. Railroads at military installations had been seldom used since 1945, but they would become critical in case of mobilization. FORSCOM needed to upgrade the railroad facilities at 31 installations, including both rails and loading platforms.

In this program, the division served as a center of competence, while local districts actually did the work. Projects were based on Department of Transportation reports on tracks needing repair.

By the end of 1981, the division had initiated designs at eight installations working with the Savannah, Kansas City, Omaha, Seattle and Fort Worth districts and had started construction at Fort Riley, Kansas.

A second program involved modernizing weapon ranges at 28 installations, which the division conducted for FORSCOM and the Training and Doctrine Command (TRADOC). Most range systems still required manual labor to operate, which the Army was replacing with automated, or so-called "pop-up" ranges; and there was a need for ranges to train on new weapons and tactics.

The division outlined its activities in a proposal sent to HQUSACE June 12, 1981; HQUSACE officially tasked the division September 1; and the division signed a memorandum of understanding with the Directorate of Army Ammunition, Ranges and Targets (DAART) on October 29. Under this agreement, the division would prepare paperwork, support and help standardize design, develop requirements and equipment lists, create guide specifications, and conduct special studies. The division published the first manuals and specifications in early 1982 focusing initially on standardized infantry, armor and military operations on urban terrain (MOUT) ranges, for which it used ranges being developed at Fort Bragg, North Carolina, as prototypes. It also participated in a committee including FORSCOM, TRADOC, DAART and various installations to review designs of 17 multipurpose range complexes and 28 field fire and defense test ranges being planned. [11]

Finally, the division became involved in modernizing the Defense Communications System.

In 1980, the Army Communications Systems Agency requested HQUSACE support in preparing criteria for communications facilities in Europe, including line-of-sight radios, operational facilities and fuel storage areas. However, the designs had to meet physical security requirements and be resistant to nuclear, biological, and chemical threats and electromagnetic pulse (EMP).

Since the division had conducted research on EMP protection for many years as part of the SAFEGUARD program, the chief of engineers designated the division as technical manager of the program in April 1980. Bernard McLaughlin of the

In 1979, HQUSACE tasked the division to assist with requirements for facilities to support the Pershing, Patriot, Roland and MLRS missile systems. Weapon systems like the MLRS pictured required additional maintenance and training facilities.

(U.S. Army photo by Spc. Ashley Marble)

Communications Systems Agency visited Huntsville April 17 to discuss the project, and directed the division to use existing protection criteria June 1.

At a follow-up meeting August 12, the division identified the schedule and costs – it would require $250,000 to complete a scope of work and management plan.

Finished December 19, the plan required upgrade of 12 installations in Germany selected by the division, Communications Systems Agency, Army Communications Command and Defense Communications Agency. Based on this initial input, the division distributed the program plan and criteria September 4, 1981, using the lowest level of security. The division would then survey each of the installations to determine what changes were needed to bring them up to this standard.

The Arab oil embargo tripled oil prices to $12 per gallon and caused an increase in gas prices nationwide.
(Photo by David Falconer)

After making a practice survey at Fort Detrick, Maryland, in October 1981, a division team including Gaines Gravlee, William Major, Marin Warvi, Jimmie Stephenson, Ben Small, Ron Smith and Tom Bolt completed the surveys from October to December 1981. The division submitted the survey results in March 1982 and completed a Phase I report in May. The report identified issues with existing sites and changes needed to meet varying security levels. It outlined a program that included Phase II for design and Phase III for expansion to additional installations. Based on data collected at the Donnersburg installation, the division also published guidance in 1983 for security systems, which included survey methods, cost estimates and technology selection. This was the first division project focusing on physical security technology. [12]

Energy Programs

Despite the Environmental Research and Development Administration being absorbed into the new Department of Energy (DOE) in 1977, the Huntsville Division continued to support energy research programs. The division had supported the clean boiler program since 1974 to develop clean-coal fuels useable in boilers, but the program ended in June 1977 when the contractor was unable to develop a prototype due to the immaturity of the technology.

Nevertheless, the division continued support of the pipeline gasification project to convert coal to a gas usable for industrial and residential purposes. The division helped prepare two multiphase contracts, which the DOE awarded in 1977 to Conoco and Illinois Coal Gasification Group.

Like the clean boiler contracts, these contracts included government-funded concept, design and construction phases, and an operation phase at 50 percent private funding. The division opened one-person field offices in Pittsburgh, Pennsylvania, and Livingston, New Jersey, to provide technical support to these contractors, and the DOE maintained a liaison in Huntsville.

The division also helped prepare a contract awarded July 29, 1979, to Procon Inc. to engineer and build a prototype HYGAS plant. This was a process developed by the Institute of Gas Technology after World War II that converted coal to a substitute natural gas using a hydro-gasification process.

In November 1977, the DOE named the Huntsville Division engineer the administrative contracting officer for all three contracts with power to approve subcontracts worth up to $1 million. The only difficulty that arose during development of the plants was a complaint raised by British Gas over a proprietary pipeline gasification process, which the division resolved by modifying the Conoco contract. Labor-hours initially increased by 20 percent through 1979.

In 1981, however, Congress decided not to support construction of prototype plants for the following fiscal year, and the DOE made additional budgetary cuts. As a result, the division terminated the pipeline gasification contracts after Phase I in June 1981 and July 1982. Despite these cuts, the Fossil Fuel Processing Division of the DOE continued to leverage Huntsville Division contracting expertise to prepare $3.1 million in contracts for construction of the Carbondale Mining Research Center, Illinois, and Pittsburgh Energy Technology Center, Pennsylvania. [13]

Meanwhile, the Huntsville Division also assisted the DOE with preparing for construction of facilities for the Strategic Petroleum Reserve (SPR). Congress had established the reserve in the 1974 Energy Policy and Conservation Act (PL 94-163) to stabilize oil prices, which had spiked after the Arab-Israeli War of 1973 and subsequent Arab oil embargo – oil prices had tripled to $12 per gallon.

The concept of the reserve was to store and then sell oil when necessary to minimize supply fluctuations and maintain price levels. The law required maintenance of a 90-day supply of oil, which regulations set initially at 500 million barrels but which increased to 750 million barrels in 1978. By law, the reserve had to reach 10 percent of this amount within 18 months (1975), 25 percent within three years (1977), and 100 percent within seven years (1981).

By 1978, however, the DOE, which had inherited the program from the Environmental Research and Development Administration, had only been able to store 69 million of the 250

million barrels required. Part of the problem was that the DOE lacked sufficient storage to hold the oil.

To meet its congressional requirement, the DOE tasked the division in 1978 to support construction of new storage areas holding up to a billion barrels in a three-phase plan: Phase I would include storage for 358 million barrels; Phase II for 280 million; and Phase III up to 472 million. Phase I and II would focus geographically on Gulf of Mexico states (primarily Louisiana and Texas), and Phase III would focus on inland storage areas, both above and below ground. The DOE tasked the division to manage construction of both Phase II and III – Phase I was already ongoing.

The program was potentially a multi-billion dollar program as large as SAFEGUARD or MPBSCP. The division opened a three-person project office with the DOE in New Orleans, assigned an assistant division engineer to oversee the office, created an SPR Division, and staffed 16 employees to support the program with plans to expand to 25. [14]

From January to August 1979, the division analyzed vendors to prepare a major solicitation, providing four members of a DOE source evaluation board. Eventually, the DOE made a decision not to proceed with these large turnkey contracts, partly due to delays resulting from new environmental requirements.

The 1970 National Environmental Policy Act required development of environmental impact statements reviewed by multiple conservation and resource agencies for all new construction projects, but much of the federal government was still adjusting to the requirement.

Instead, the division participated in source selection for three smaller projects at Cote Blanche and Napoleonville, Louisiana, and Ironton, Minnesota, which already had approved environmental impact statements. The DOE believed caves at the sites could be used for storage. However, issues in obtaining real estate and permission to use privately-owned pipelines to move the oil derailed the Ironton solicitation, and negotiations on the other sites floundered.

By the end of 1979, the DOE had dramatically scaled back division involvement. The division cut personnel from 25 planned spaces in 1979 to 14 in 1980.

Next, the DOE involved the division in the Regional and Noncontiguous Storage Program. This program focused on storage of oil in regions that experienced frequent shortages, primarily the Northeast states, Hawaii, and Puerto Rico.

In 1980, the division prepared performance and design criteria documents and completed a study of Puerto Rico. Because of budget reductions, however, the DOE eliminated the regional program as well. This was partly a response to the 1979 Iranian hostage crisis, which created problems with obtaining oil, making storage issues less pressing. Filling the reserve resumed at the end of 1980 with passage of the Energy Security Act (PL 96-294), which required a fill rate of 100,000 barrels per day, but it also spread the need for more storage over a greater length of time. Thus, the DOE suspended work, although the division was able to complete criteria development and publish a handbook for the source evaluation board. [15]

Another project for the DOE involved modernization of nuclear weapon production and storage.

The Pantex Plant in Texas was a World War II ordnance plant that the Atomic Energy Commission had purchased in 1951 to produce nuclear weapons and near-nuclear conventional weapons. The plant, along with the Atomic Energy Commission, transferred to DOE control in 1977. Like other ordnance plants constructed in World War II, the Pantex Plant was severely outdated by the 1970s with insufficient security and safety features.

In 1977, the DOE requested Huntsville Division support with modernization of the plant based on its ongoing relationship and the division's experience in the MPBSCP program.Division personnel conducted a site visit in 1979, and Charles Huang developed a design manual for the project focusing on protective structures.

In 1980, the division provided technical support and reviewed concept designs for a high-explosives machining development facility, a universal pilot plant, and a production and assembly facility. The division continued to consult on contractor designs on a reimbursable basis and completed design reviews in early 1981.

On March 13 and April 8, 1981, DOE and HQUSACE personnel, including Chief of Engineers Lt. Gen. Joe Bratton, met to discuss the division's future involvement in the project. Under the management plan developed by the Huntsville and Southwestern divisions, the Southwestern Division and Fort Worth District would provide on-site management, and the Huntsville Division would provide technical assistance and review.

In May, the Corps and the DOE signed an interagency agreement. In October, the Huntsville Division and Fort Worth District agreed that the division would provide ongoing technical support to the Fort Worth District's Amarillo Area Office during construction.

In a related project, the Defense Nuclear Agency requested Huntsville Division support in designing a test, evaluation and training site for nuclear weapon storage in 1981. HQUSACE issued the task assignment to the division August 27, 1981. After Russ Hilyar and Al Bertini of the Huntsville Division completed a site evaluation, the Defense Nuclear Agency approved a site at Fort McClellan, Alabama, in December 1981. Construction was expected to begin in 1983. [16]

In addition to supporting the DOE in designing various facilities, the Huntsville Division also became involved in several energy improvement and conservation programs for the Army. As a result of the ongoing energy crisis resulting from the Arab oil embargo, one of President Carter's major concerns was energy conservation – Executive Order 12003 of 1977 required energy

conservation measures in all federal facilities. Every federal agency had to develop within six months a plan to reduce energy consumption by 20 percent at existing facilities and 45 percent at new facilities by 1985.

In response, the Army created the Energy Engineering Analysis Program (EEAP) with an ultimate goal of reducing energy use by 50 percent by 1985.

In 1978, HQUSACE issued the Army Facilities Energy Plan, which outlined guidance of the program, including funding, objectives, and studies and projects to be completed by districts and installations. Essentially, the program provided guidance on building designs and additional project funding to improve energy use. HQUSACE tasked the division to support the growing program September 13, 1979, and the division submitted its management plan December 6. In this plan, it would provide management and technical assistance to districts, which would execute the program.

On January 10, 1980, HQUSACE assigned the division as the central manager of the program. The division named Bobby Ganus as the program manager.

After meeting with the districts and major Army commands in May and June, the division developed a multiyear plan to analyze energy use at all Army installations to use as a baseline and develop plans and projects spanning the range of energy improvements, including storm windows, insulation, caulking, heating and cooling air flows, incinerators, solar heating, shower flow restrictors, automated lighting systems and electronic thermostats. Projects valued at under $200,000 would be paid for by local districts or major commands; larger projects would be federally funded but would take more time to approve and implement. The division estimated expending eight labor years over the remainder of the year with annual funding of $384,000 thereafter.

The division briefed the plan to the Assistant Secretary of the Army September 5, 1980, and Congress funded the program through 1986, starting with $12.75 million in 1981, most of which went to projects at the district level.

In 1981, the division expanded the program through the addition of maintenance plans and minor construction. It briefed the major commands about the program in April 1981 to identify new requirements and then met with districts in July to discuss the scope of work for fiscal year 1982, even as installations began to implement the program. [17]

One of the larger EEAP projects that the Army examined was using solid fuels such as coal to power bases instead of petroleum-powered generators. The use of diesel and gasoline as a primary fuel source was expensive, but many bases still used such generators as their primary power source. Several bases sought to replace generators with coal or electric plants.

Given its background in coal research, the division proposed providing districts with guidance on the application of the technology and assisting with cost verification, and HQUSACE assigned the mission June 8, 1981. The division submitted a management plan July 16, which HQUSACE accepted September 4. The division would assist with funding requests, contractor selection, development and evaluation of design packages, development of operations and maintenance guides, and evaluation of acceptance testing.

By primarily using military construction funds, the division estimated it could convert one base per year, or 16 bases through 1995. The first three candidates were Red River Army Depot, Texas; Fort Bragg, North Carolina; and Redstone Arsenal, Alabama. Since Redstone was in its own backyard, the division selected it as a pilot project and started working with the Mobile District to initiate the project. In the interim, it started development of a solid fuel design manual. [18]

A second energy conservation program the Huntsville Division supported was the Energy Monitoring and Control Systems (EMCS). It was a tri-services program managed by the Navy to install electronic control systems to manage and reduce use of electricity.

The division initially became involved in the program in 1978 as the Army's representative to the Navy to comment on manuals and guide specifications. Division personnel attended several design and review conferences in 1978 and were so impressed by the program they briefed HQUSACE on its importance and urged assignment of the division as a center of competence.

HQUSACE officially tasked the division to head the program June 7, 1979. The division would provide technical coordination during design and construction of all systems, prepare standardized design manuals and train districts on design of the systems.

By the end of the year, it had had developed a draft tri-services manual, reviewed several EMCS designs, sponsored a Corps-wide conference in October 1979 to explain the system and its benefits, and held the first EMCS training course. The division developed and presented four 40-hour courses over the next two years to Army, Navy and Air Force personnel, including the development of an EMCS simulator.

In 1980, the division reviewed four projects and helped resolve technical questions. It held four industry forums in 1980 and 1981 to receive feedback on designs, and as a result it released new guide specifications on the transmission of electronic data in 1981. By the end of 1981, it was clear the program was going to continue to grow.

On December 22, HQUSACE and the division developed a new program supervision plan, in which the division would establish technical and contractual criteria, review contracts, assure operation and maintenance of EMCS, conduct acceptance testing of hardware and software, and resolve problems with systems. Districts and divisions would henceforth supervise installations and serve as technical coordinators for the systems. [19]

International Procurement

After 1977, the Huntsville Division continued and expanded its international procurement mission.

At first, the division expanded procurement support of the Middle East Division, which had started several construction projects in 1976 for Saudi Arabia as part of the U.S. Training Mission. The Middle East Division stood up the Jidda District in April 1977 to manage major projects at the King Faisal Naval Base on the Red Sea, the Tabuk Training School, and the King Faisal Military Cantonment. At its peak in 1980, these projects involved 300 Corps personnel and $1 billion in funding.

The Huntsville Division's role in procuring mostly high-end construction material was more modest, but impressive nonetheless.

In 1977, the division awarded 108 contracts valued at $49 million to procure everything from household items to generators, pre-mobilization camps and re-locatable buildings. By 1978, this had grown to 869 contracts worth $65 million, which resulted in 3,354 purchase orders and 886 deliveries. The division made its final procurement in 1979.

There was some talk of transferring the remaining procurement tasks to the rear detachment of the Middle East Division, which Colonel Poteat warned would cause the division "to lose its procurement force," but the amount of final orders was higher than expected. Administration of the contracts continued through 1980 with a gradual decline in personnel and a final contract close-out on September 30, 1981. Ray Aldridge, the chief of the Procurement Division, called the mission, which had lasted five years, "a real nation-building project." [20]

Meanwhile, the division also finally started to make progress in the Jordan Armor Rebuild Project. After multiple delays and changes in the plant design by Jordanian Armed Forces, the division finally received approval to proceed on October 1977, resulting in a mid-June 1978 award of the design contract to Giffels Associates of Detroit, Michigan.

The design would include an 11-building complex to rebuild 80 tanks per year. After Jordanian approval of the 90 percent design review, the division awarded the $65 million construction contract in March 1980.

In December 1979, Jordan also signed the Foreign Military Sales case for the division to assist with procurement of equipment for the plant.

Starting in February 1980, the division procured 1,700 plant items for $10 million and issued 300 other contracts for minor items. Total investment in time from procurement personnel amounted to 10 labor-years over just 18 months. The contractors delivered all items by freighter by the end of 1981.

In addition, Jordan signed a Foreign Military Sales case April 21, 1980, for development of a management plan, including detailed operational instructions, production schedules, workflows, manning, materials planning, facility support, maintenance and safety.

The division awarded the management contract to Dynetics for $308,000. The contractor presented the final management plan in June 1981. The plant became operational shortly thereafter, and the first tanks rolled off the assembly line in 1982; the plant reached full production in 1985. Although the project had gotten off to a rocky start, Colonel Poteat called the final result an "outstanding end product." [21]

After 1979, the Huntsville Division gained two new international missions as a result of the Camp David Accords.

One of President Carter's goals had been to negotiate a peace settlement between Israel and Egypt, technically at war since the 1967 Arab-Israeli, or Six-Day War. After months of negotiations with Egyptian President Anwar Sadat and Israeli Prime Minister Menachem Begin at Camp David, Maryland, both parties accepted an end to hostilities contingent on withdrawal of Israeli forces from the Sinai Peninsula. One of the sticking points of the agreement, however, was abandonment of two Israeli airbases at Eatam and Etzion, which headquartered five squadrons of war planes that Israel considered critical to its defense.

The Israelis were concerned they would be unable to build new airbases and withdraw from Sinai within the three years stipulated by the treaty, threatening the entire agreement.

To break this loggerhead, Carter offered to build two new airbases in Israel at U.S. expense for $800 million within 30 months, allowing six months of acceptance testing. Israel agreed to allow the agreement to go forward, and named sites at Be'er Sheva and Ovda, just north and south of Ramon in the Negev Desert above Eilat.

Planning for the mission started in September 1978 before signature of the accords when Assistant Secretary of Defense David E. McGiffert called Deputy Chief of Engineers Maj. Gen. Bates C. Burnell and Brig. Gen. Paul T. Hartung of the Air Force to the Pentagon to organize a survey team. Although the Air Force managed the funds, Brigadier General Hartung believed the Corps was better suited for fast-track design and construction. Chief of Engineers Lieutenant General Morris, who considered the project the top priority of the Corps, brought in Col. James E. Hays from the Construction Engineering Research Laboratory in Champaign, Illinois, to head up initial planning efforts. The organization was unique from the beginning. Because of high inflation in Israel, the Corps would have to import all contracted workers. A consortium of three contractors would manage the project of which one contractor would design and build each base. Because of the short deadline to complete it, the Corps sought national priority among manufacturers under the Defense Production Action of 1950 to obtain supplies as fast as possible.

On December 10, 1979, Carter signed Executive Order 12178, which waived federal contracting regulations, and the Department

of Defense assigned the project a DX BRICK-BAT rating, which under DOD Instruction 4200.1 required contractors to meet the needs of this project ahead of other non-DX projects. [22]

In line with his views about not managing projects out of the headquarters, the Chief of Engineers looked for a division to manage the project. Due to political sensitivities, the Middle East Division in Saudi Arabia could not be involved in the Israeli project. Because the Europe Division was already overwhelmed with Cold War construction, Maj. Gen. James A. Johnson of the North Atlantic Division lobbied for and was assigned the job. He established two area offices at the construction sites under supervision of a Near East Project Office in Tel Aviv, with a rear detachment at the division headquarters in New York. He selected Col. Clarence D. Gilkey who had experience with the U.S. Training Mission in Saudi Arabia as project manager.

Discussions with the Israelis started shortly after signature of the accord March 26, 1979. Colonel Gilkey arrived in Israel in April and began working with Israeli General Moshe Bar-Tov, but immediately encountered opposition to what Bar-Tov considered wasteful spending.

The Israelis sought to make design changes and wanted greater use of local labor and materials; and resistance to the treaty among some in the Israeli military added to the delays. Once guide specifications and designs were underway in June based on Israeli input, Colonel Gilkey ran into delays in funding and hiring in the U.S. At times, Johnson seemed to consider the project a lower priority than domestic projects, and he largely gave Colonel Gilkey a free hand in Israel.

Colonel Gilkey, meanwhile, ran into continuous difficulties in contending with both Bar-Tov and Brigadier General Hartung, and the project soon fell behind schedule. [23]

By August 1979, Major General Johnson had moved to headquarters and was replaced by Maj. Gen. Bennett L. Lewis as North Atlantic Division commander. Much more detail-oriented, Major General Lewis believed "start-up of the Israel project is a good example of how not to do it."

On becoming aware of the project status, he immediately lobbied Lieutenant General Morris for a general officer to contend with the generals in Israel and get the project back on track. Major General Lewis' recommendation for the job was Huntsville Division Commander Brig. Gen. Max W. Noah, a tall officer known as the "gentle giant" who had "considerable experience with resource management" as well as a strong "physical presence."

With the concurrence of the Chief of Engineers, Brigadier General Noah departed for Israel on temporary assignment in January 1980. While Colonel Gilkey technically remained the project manager, Brigadier General Noah immediately took control of the situation. He worked to improve the schedule and finances, established a joint project management board to oversee contracting and resolved issues with steel configuration control.

"To build airfields here is like trying to wrestle a tiger while you are wearing a straightjacket," he said. The biggest concern for Major General Lewis, and the primary reason he selected the commander of the Huntsville Division, was problems with procurement because of the lack of coordination between contractors and the Corps.

Within a week, Brigadier General Noah brought in Procurement Chief Ray Aldridge and Leonard Getty of the Facilities Development Branch. Backed by a Department of Defense audit of the contractors, Aldridge stressed the "need for training in the purchasing departments." He brought Roy E. Edwards from the division to help train the contractors in procurement.

Soon, the Chief of Engineers began to work directly with Brigadier General Noah, and Major General Lewis withdrew from daily operations. The division employees stayed for four months until Brig. Gen. John Wall relieved Brigadier General Noah in April.

Shortly before his departure, Noah received a promotion to major general, and he rotated out of command in September. Largely as a result of Huntsville Division efforts to bring the situation under control, the Corps completed the project nine months ahead of schedule in early 1982. [24]

A second mission, resulting from the Camp David Accords, was support of construction of peacekeeping facilities in the Sinai Peninsula. Part of the accords included the presence of multinational observers and peacekeeping forces during Israel's withdrawal from Sinai. The agreement divided the peninsula into three zones: Zones A and B occupied by multinational observers and Zone C occupied by a multinational force. Since the United Nations did not approve the Camp David Accords, the parties signed an additional protocol June 25, 1981, establishing the multinational force, including U.S. personnel.

As a result of this agreement, the Corps of Engineers needed to build facilities to house this force prior to scheduled withdrawal in 1982.

In June 1981, HQUSACE briefed Ray Aldridge and Engineering Chief R.L. Phillips about the division's role, timeline and funding in what was initially titled "Z-Prime Project."

Once again, the division requested and on June 23 obtained waivers from normal procurement and contracting processes to meet the compressed schedule.

In the official tasking memorandum of July 8, HQUSACE directed the division to finalize criteria and designs; negotiate and award letter contracts to build the facilities; provide temporary personnel for technical, administrative and contractual support; and develop an organization for the construction management office.

The division briefed Israeli contractors August 13, 1981, and after holding an industry briefing August 17, selected the contractor August 20, and started preparation of the letter

contract August 21. The division selected Deputy Division Engineer Col. William E. Lee Jr. to command the Sinai Construction Management Office.

Unfortunately, no funds were initially available for the project in August, which delayed issue of the contract letter until September 2. The division then transferred management of the contract to Colonel Lee and the construction office. Under a memorandum of understanding between the office and the division, numerous division personnel deployed to Sinai through the end of the year to support initial efforts to make progress on the project. [25]

The Earliest Environmental Missions

One of the major new mission sets the Huntsville Division picked up after 1977 was support of environmental cleanup and pollution control.

After World War II, there had been a growing interest in preserving and enjoying the natural environment as standards of living improved. As people became more aware of threats to their wilderness retreats, health and way of life, they began to demand change. Books such as Rachel Carson's Silent Spring , Paul Ehrlich's Population Bomb, and Dennis Meadows' Limits to Growth, which identified pollution and blamed environmental issues on population growth, promoted the belief that man's intrusion into nature and especially unrestrained commercial and government activity were the root causes of environmental destruction.

A series of environmental threats, including pollution causing a fish kill on the Mississippi River in 1965, a 1966 plan to dam the Grand Canyon, and a 1969 California oil spill, resulted in a series of efforts to strengthen laws protecting the environment. These included the Clean Water Acts of 1960 and 1965, the Clean Air Acts of 1963 and 1967, the Endangered Species Acts of 1964 and 1968, the National Environmental Policy Act (NEPA) in 1970, and creation of the Environmental Protection Agency (EPA) in 1970.

Of these, NEPA had the largest impact on the Corps of Engineers by requiring an environmental impact statement for all new construction, greater coordination with the EPA and other environmental and conservation agencies, and increased public involvement in decision-making.

It was not until 1977 that Congress amended the Clean Water and Air Acts to require compliance of all federal facilities to federal, state and local pollution laws. By early 1978, the EPA had surveyed several Army installations and found 32 noncompliant. Of these, it considered eight a priority due to the level of pollution.

To address these issues, the Army established the Army Pollution Abatement Program (APAP), later renamed the Army Pollution Prevention Program. [26]

On March 15, 1978, HQUSACE directed all districts to conduct surveys of bases for pollution issues and ordered the Huntsville Division to coordinate the effort. The official tasking memo came on June 6 requesting the division submit a management plan for APAP and identify criteria for cleanup by September 1.

The districts completed surveys of 129 of 144 installations by May 9, 1978, with the rest due for completion by September; of these, the division found 116 noncompliant. The division briefed HQUSACE on the situation at a program conference that discussed various projects and set milestones for Phase II.

On May 24, the division held a Corps-wide APAP conference attended by nine divisions, nine districts and four other federal agencies. Topics ranged from motor pool oil spills to vehicle wash racks to wastewater treatment plants. Based on these discussions, the Corps designated the Mobile District as the design center for waste incinerators and Fort Worth District for demilitarization projects, while the Huntsville Division ran the program and manned a technical support center to assist districts.

The conference then prioritized and packaged future work, with 23 projects worth $50 million scheduled for fiscal year 1980 and 60 projects worth $98.4 million for 1981. This was in addition to 60 projects valued at $5 million that were ongoing, plus 155 new requirements. In the interim, the program made significant progress. Because Congress provided limited funds for 1979, the division could do little that year.

However, by 1980, there were 135 projects worth $348 million in various stages of completion, with another 51 projects worth $141 million programmed for 1981-1983. As a result, noncompliance had dropped from 59 installations in 1980 to 26 in 1981 and nine in 1982.

In 1981, however, Congress greatly reduced funding for APAP, and HQUSACE encouraged a phase down of Huntsville Division activities in favor of decentralized management, although the division did remain as a center of competence for APAP. It continued to support the program at a small level through documentation, design review and other tasks, and it supported a series of groundwater studies for the Development and Readiness Command (DARCOM). [27]

A major part of APAP included monitoring and management of wastes on military installations. Congress passed the Resource Conservation and Recovery Act (RCRA) in 1976 as Public Law 94-580. This law required cradle-to-grave management of hazardous wastes, including transportation, storage, treatment and disposal of wastes.

Among its requirements were monitoring of sites, restoration of leaks and permits to store waste. Congress followed this less than four years later with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or Public Law 96-510, which provided a "Superfund" and required cleanup of documented polluted sites.

In 1980, the EPA published initial regulations for RCRA, and

several major commands requested Huntsville Division assistance in monitoring stored wastes. According to the regulations, monitoring wells had to be in place around all waste storage areas by November 19, 1981.

In 1979, installation, district and Huntsville Division surveys identified 170 sites at 52 installations that required additional investigation of compliance to RCRA.

By 1980, work had started on installing monitoring technologies at 38 sites, yet funding shortages for fiscal year 1981 caused delays in compliance of some sites to 1981.

The division worked with the Army Environmental Health Agency and Army Toxic and Hazardous Material Agency to obtain assistance since these agencies had additional funding, but they did not have engineering or construction capabilities and so could only help with monitoring or monitoring technologies. The division began holding quarterly meetings to coordinate among the various agencies involved and to track progress.

Contributing to the delays was the evolving understanding of pollution issues. In May 1981, the EPA revised groundwater regulations, which suspended work at 22 installations.

Nevertheless, the division was able to complete all studies by September 1981. Monitoring started at 44 installations, with another 29 for DARCOM, and the division contracted private laboratories to analyze samples and report on pollution issues. [28]

Origins of the Chemical Demilitarization Mission

In 1981, the Huntsville Division also became involved for the first time in chemical demilitarization. While not an environmental program per se, demilitarization required specialized handling of hazardous wastes as required by law.

After the Korean War, the U.S. had 36,000 tons of chemical weapons. Most of these were stored in containers, but some were weaponized, mostly in M34 and M55 shells. The Army stored the majority of these weapons at eight depots or arsenals nationwide, including Aberdeen Proving Ground, Maryland; Newport Army Ammunition Plant, Indiana; Lexington-Bluegrass Army Depot, Kentucky; Anniston Army Depot, Alabama; Pine Bluff Arsenal, Arkansas; Pueblo Depot Activity, Colorado; Tooele Army Depot, Utah; and Umatilla Depot Activity, Oregon; although there were several smaller storage sites at other locations.

As these containers and weapons aged, several leaks had occurred, creating significant risks with continued storage. The Army had directed the safe disposal of obsolete weapons starting in the 1960s, but its initial plan to dump chemical weapons in the ocean under Operation CHASE received heavy criticism.

Since World War II, ocean dumping of unused munitions was a common form of elimination used by many nations, along with burial and open pit burning.

In 1969, the Army requested review of the problem by a National Academy of Sciences panel, which recommended use of controlled incineration or neutralization to eliminate the weapons, incineration for blood and blister agents and neutralization for nerve agents.

Congress directed in Public Law 91-121 the Department of Health and Human Services and Office of the Surgeon General review all plans to transport, test or dispose of chemical agents. In addition, the Military Sales Act of 1971 (PL 91-672) directed elimination of chemical weapons in Japan and prevented use of any funds to move such weapons from Okinawa to the U.S.

Instead, the Army moved these weapons to the Johnston Atoll in the Pacific in order to turn over all remaining U.S. holdings and bases to Japan in 1972. [29]

Over the next decade, the Army experimented with several disposal methods. From 1972 to 1982, Rocky Mountain Arsenal, Colorado, and Tooele Army Depot neutralized 8.4 tons of Sarin gas using chemical processes, but found this process ineffective – it did not always remove all chemical agents.

Altogether, the bases destroyed 14 million pounds of the agent, including through the use of other disposal methods. At Anniston Army Depot, Pine Bluff Arsenal, Lexington-Bluegrass Depot and Dugway Proving Ground, Utah, the Army used drill and transfer systems to remove chemicals from weapons and transfer to containers. This process, which involved drilling a hole in munitions and draining out chemical munitions in a contained environment, was slow – an eight-hour shift could process about six rounds on average – and was very dangerous. It was, however, the only process available to extract chemicals from corroding weapons or containers and was planned for use at Umatilla, Pueblo and Aberdeen.

In 1979, the Army began operation of the Chemical Agent Munitions Disposal System (CAMDS) pilot plant at Tooele, which used industrial processes to dispose of weapons using primarily incineration – by this time it had settled on incineration as the safest means of disposal in most cases. The plant was, however, very small in capacity and required later expansion.

In 1980, the Defense Science Board recommended a national program to dispose of the remaining 776,000 weapons rather than the current decentralized approach to demilitarization.

The U.S. Army Toxic and Hazardous Material Agency (USATHAMA) completed a study over the next year to develop a plan. This study recommended destroying the weapons over the next 20 years at a cost of more than $2 billion using processes like that of CAMDS. Because of the safety issues with relocating chemical weapons due to the real and perceived possibility of leaks and spills, it recommended building plants at each of the storage locations, starting with Johnston Atoll, which would form the pilot project. [30]

In 1981, USATHAMA requested the support of the Huntsville Division to assist with construction of the plants,

starting with Johnston Atoll. The agency was already aware of the capabilities of the division after coordination on the pollution monitoring program since 1980.

USATHAMA signed a memorandum of understanding with the division in August 1981, although it was still working on a final overarching plan for the plants. The division would provide scopes of work to contract criteria development, design, equipment procurement and construction of the plants.

In late 1981, the division issued the criteria development contract for the Johnston Atoll plant using a process similar to that of CAMDS, but larger in scale. The chemical demilitarization program would end up being one of the largest and longest-running programs supported by the division, lasting more than 30 years and costing billions of dollars. It involved much more than the division's growing hazardous materials expertise but its entire capability for complex design and procurement as well. [31]

Computer System Testing and Support

In 1978, the Huntsville Division gained responsibility for testing and maintaining computer-aided engineering and design systems (CAEADS).

While today most take computers largely for granted, use of computers for engineering tasks was still relatively rare in the 1970s. The concept of using machines for business processes, not new in many ways, had rapidly developed since the 19th century. This development had focused primarily on simplifying repetitive mathematical tasks (through adding machines) or to assist with large calculations (through difference engines). Most of these computers were mechanical.

The first fully electronic computer was the ENIAC, which J. Presper Eckert and Capt. Herman H. Goldstine had developed in 1946 for the Ballistic Research Laboratory to rapidly calculate firing solutions. The commercialized version of this computer – the UNIVAC – helped to popularize the concept of an "electronic brain" by accurately predicting election results in 1952. The following year, IBM introduced modular computer systems that used punch cards to enter and store data. These were enormous systems that provided mathematical results – there still was no graphical capability.

By 1960, introduction of the microchip helped to greatly reduce the size and increase the processing speed of computers as reflected in Moore's Law, the 1965 prediction that processor speeds would double every two years.

In a short time, large mainframes gave way to microcomputers in 1973 and personal computers in 1976, which included simple graphics capabilities. Suddenly, it became possible and affordable to provide enterprise access to computers capable of assisting with engineering tasks. [32]

Since use of computers for engineering was still relatively new, the Construction Engineering Research Laboratory (CERL) in Champaign, Illinois, had taken the lead in planning and developing five CAEADS systems from 1977 to 1981.

HQUSACE lacked the resources to deploy and maintain the systems after development, so it assigned the Huntsville Division as responsible agency for the systems in 1978; at the same time it moved several other missions from HQUSACE to the division. Shortly afterward, Army Regulation 18-1 divided development of information systems into three phases: planning; development; and installation, operation and maintenance, which separated actual creation of software from long-term maintenance. CERL was responsible for the first two phases, and the division was responsible for the third.

In May 1980, the division met with CERL personnel to resolve processes for handoff and evaluation of the systems. Over the next few years, the division worked closely with CERL to test, correct, document, deploy and maintain these systems. The division's Automated Data Processing Center proved critical in this process.

The first of the systems transferred to the division was EDITSPEC, a software program that automatically produced project specifications based on user input and allowed editing of these specifications. The division agreed to provide a field environment to test EDITSPEC, and it helped to create a database and enter initial data. After purchasing and installing computer terminals, the division conducted performance evaluations using data from the Mississippi AAP. It recommended adoption of EDITSPEC in December 1980. Based on this, HQUSACE approved extending the system Corps-wide October 8, 1981. The division helped complete documentation for the system and developed and delivered training to districts and divisions adopting the system. [33]

Two other applications transferred to the Huntsville Division in 1978 included the DD Form 1391 Processor and Systemic Evaluation and Review of Criteria for Habitability (SEARCH). The DD Form 1391 was the standard form the Corps used to justify costs. Manual maintenance of the form was very time-consuming because of the frequent number of design modifications. CERL developed the software to review, edit and automatically populate the form. It created a unique tracking number, updated funds based on parameters entered, tracked changes and allowed review of comments.

The division tested and deployed the system in 1980. During testing, the primary problem encountered was using distributed systems via computer networks. AUTOVON lines used for military networks included additional electronic coding to allow override of routine calls and signals, which interfered with the software's use, although it was possible to use the program on normal commercial lines.

The SEARCH software assisted engineers in checking facility designs for compliance to criteria. CERL had developed the program based on a system developed in the early 1970s and incorporated a second program developed at the University of Michigan to input sketches. The division assisted CERL with

system evaluation. The division leased computers to conduct testing January to October 1981. This initial test revealed deficiencies in handling multi-story buildings.

In a supplemental scope of work issued March 25, 1981, HQUSACE also assigned the division responsibility to maintain the SKETCH-INPUT and DRAFT modules that allowed input of maps and other data. Two other systems added in 1981 included the Computer Evaluation of Utility Plans (CEUP) and the Building Loan Analysis and Systems Thermodynamics (BLAST), applications for evaluating utility requirements and energy consumption and system performance. After receiving documentation for and testing CEUP modules for water and sewerage, the division determined that the system needed additional development. Because of continuing development, CERL did not transfer BLAST to the division until late 1982. [34]

The Huntsville Division was also one of the earliest adopters of computer-aided design (CAD) to prepare and maintain architectural designs. Although several military bases and Corps districts had experimented with or developed home-grown CAD systems – particularly the Savannah, Kansas City, and St. Louis districts – the time and cost of their development had been high and usually resulted in incompatible data that created problems with sharing and printing technical drawings.

In 1978, the division had become involved in developing master plans as part of MPBSCP. Army Regulation 210-20 required development of master plans for all installations in support of potential mobilization, and the division assisted DARCOM in preparing plans for all AAPs. Given the investment in time and money, the division examined the possibility of using CAD to prepare the plans. Using the Sunflower AAP as an example, the division completed a study in 1978 that demonstrated the cost savings from using CAD.

In particular, the study noted that engineers could use a keyboard to enter words and data which could be saved and continually edited, taking roughly 30 minutes to print a drawing, versus many days to redraw one. Based on this and further experience in using CAD on a mainframe on Redstone Arsenal to complete civil engineering drawings, the division requested permission to purchase a CAD system for use in the remaining master plans.

HQUSACE approved leasing a system the following year – most computer companies leased expensive computer hardware at the time.

In 1980, the division awarded a contract to computer graphics pioneer M&S Computing of Huntsville (later renamed Intergraph Corporation), to lease minicomputer terminals and a mainframe. Neal G. Davis of the Automated Data Processing Center was the project manager. Intergraph installed the system in February 1981. This was the first major purchase of a standardized CAD system in the Corps of Engineers. [35]

The Huntsville Division used this leased CAD system to complete drawings for several AAPs, starting with the Sunflower AAP, which it used as a pilot project. Division personnel conducted new surveys and completed the drawings in January 1982.

This was not only the first master plan completed for an Army installation, it was the first use of CAD to develop drawings for a large, complex or multi-building site, thereby demonstrating the power of this new technology. The division printed the final map products created for the program in full color, demonstrating the higher drawing quality of CAD systems compared to hand-drawn sketches.

Davis trained engineers and technicians throughout the division on use of the system, allowing wide participation among multiple employees. The division then produced new engineering guides for completing master plans.

Even before completing this pilot project, the division began work on master plans for the Rock Island and Redstone arsenals in September 1981. It issued a $3.43 million contract to complete new surveys and plans September 25, 1981, followed by a $1.89 million agreement for the contractor to use CAD to complete drawings for Rock Island. In the interim, the division began working with HQUSACE to arrange a Corps-wide procurement of CAD systems for future projects. [36]

Training Management

The final mission transferred from HQUSACE to the Huntsville Division in 1978 was the management of all Corps-wide training. The rationale for the move, as with transfer of the other programs that year, was the decline of the division's SAFEGUARD mission and the desire to reduce the mission of headquarters primarily to policy and oversight. However, the division was not completely without any experience with training. It had been involved in developing training facilities at Fort Bliss, Texas, for SAFEGUARD prior to completion of the facilities.

In 1967, the division had designed a 13-building SAFEGUARD Central Training Complex, although for cost reasons the SAFEGUARD System Command scaled this back to seven new buildings and renovation of five others, which Fort Bliss completed for $3.5 million by 1972 in time to train the first SAFEGUARD units. The facilities included labs for electrical systems, mechanics, power generation, diesel engines, radars, and even a five-silo mock launch station area, plus classrooms, barracks, a warehouse, and security systems in a "pleasant atmosphere."

In addition, the division contracted training at the SAFEGUARD facilities at Grand Forks. Like all Corps organizations, the division also conducted training for its own personnel in various engineering, contracting, and administrative subjects, and it had developed training guides for numerous other programs and systems, especially since 1976.

In any case, the result of the decision was the establishment of the Corps of Engineers Training Management Division in Huntsville in 1978, which centralized all Corps of Engineers training management. [37]

The headquarters of the new division was at the Huntsville Division's Cummings Research Park office and included 18 spaces and six branches in 1979. That year, because of growth in the program, the division relocated to a leased two-story facility on North Memorial Parkway in Huntsville, which included three classrooms, a lounge, offices, and a separate warehouse.

Among those who moved to Huntsville as part of the transfer was Charles Dahlgren of HQUSACE, who continued to serve as chief of the organization until 1979. Replacing him as chief was Emmet Creekmore, formerly of the Missile and Munitions School on Redstone Arsenal. Two others who also moved from headquarters were Richard Sanborn and Arthur Dekelman. Frank Neilson of the U.S. Waterways Experiment Station (WES) in Vicksburg, Mississippi, transferred as the research and development adviser. HQUSACE was very supportive of the program and helped to market it heavily. One division member, Jeff Seward, developed a training briefing that he presented at multiple venues.

The training division also had, from the beginning, a close relationship with the University of Alabama in Huntsville (UAH).

In 1979, the Chief of Engineers expressed concern that Corps training needed to address environmental and energy programs.

On October 31, 1979, Huntsville Division Engineer Brigadier General Noah met with John Wright, the president of UAH, to enlist the university's assistance. Brigadier General Noah formed an ad hoc committee including Maj. Gen. E.R. Heiberg III, Brigadier General Wall, Wright, and key UAH faculty to advise the Corps on training programs. Mike Rand, professor of environmental studies, and Gerald A. Guinn, the director of the Solar Energy Center at UAH, served as academic advisers to the division. In addition, the university offered the use of its facilities to Corps students. [38]

The training division offered its first course in September 1978. There were 32 attendees for a 59-hour course. By April 1979, the division was offering 106 courses. In addition, WES presented 40 courses annually to 1,200 students. Most of the instructors for the in-house courses came from knowledgeable personnel at other Corps districts and divisions since many courses emphasized special engineering areas, but the division trained and supervised all trainers. Contractors from various industries provided one-third of the instructors.

By 1981, there were 400 instructors participating in the program. The division established tuition rates based on its overhead rate, which it charged to the districts and divisions three times per year. Students traveled to Huntsville (or other facilities) on temporary duty and charged the government for reimbursement of travel costs. However, a 1981 audit provided a

On April 18, 1968, Brig. Gen. Ivey O. Drewry Jr., commanding general, U.S. Army Sentinel System Command, joined Alabama State Senator Eugene M. McLain Jr.; Col. George A. Rebh, deputy division engineer, Huntsville Division; and building contractors Emory Folmar, vice president, and James Folmar, president, Huntsville Associates, at the ground-breaking ceremony for the new command headquarters on what would become known as the Cummings Research Park in Huntsville, Alabama.

(Photo courtesty of Huntsville Center Historical Archives)

more precise assessment of costs and led to revised tuition rates and the institution of monthly billing.

Arthur Deckelman and Richard Sanborn developed the first curriculum, known as the Purple Book, within 120 days of the training center's establishment. Al Stokes revised this list in December 1980, and the division updated it annually thereafter.

To plan new training, the division established a Training Review Committee of the Corps of Engineers (TRACE), which met twice per year at HQUSACE: a spring meeting to prepare for the coming year and a fall meeting to validate courses and plan new ones.

In November 1980, Engineer Regulation 350-1-414 established the Proponent Sponsored Engineer Corps Training (PROSPECT), which formalized the short-course training program, including TRACE and the roles of HQUSACE, the Training Management Division, and other Corps organizations. PROSPECT included five training areas: professional development, contract management, technical and facility engineering, environmental engineering, and energy and conservation. At that time, the Training Management Division reorganized into three branches: Support, Planning, and Training and Operations.

In March 1981, the division also gained responsibility for the Corps of Engineers Nontraditional Systems Training (CONTRAST), the first program for distance learning. The division developed exportable training packages that compressed 40 hours of content into 24 hours of facilitator-led video courses. The division used the first course on Occupational Safety and Health Administration (OSHA) regulations to train 40,000 employees Corps-wide. Later courses used computer technology to accomplish training. [39]

By the end of 1981, the Huntsville Division had developed several areas of expertise that contributed to the overall Corps of Engineers mission.

In addition to continued support of missile defense, the division was regularly supporting facility and base modernization, energy programs, procurement, environmental programs, computer system testing and maintenance, and training management. These were missions that required specialized engineering knowledge, spanned multiple districts, or supported the Corps as a whole. It made sense, therefore, for HQUSACE to assign them to an independent organization to manage – a division with resident technical expertise but without regional responsibilities.

As Colonel Poteat remarked, "Availability of highly skilled personnel has led to an organization that is unique and specialized in high technology and design, augmented by expertise in program management, procurement, systems engineering, and training management."

These qualities made the division invaluable for unique or widely distributed missions that required specialized engineering expertise.

As the division entered the 1980s, it had finally found a niche in the mission of the Corps – multidistrict projects involving advanced technology, engineering, and procurement.

Over the next decade, the division would make this niche its brand name. [40]

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4

Advanced Technology, 1982-1988

On the eve of his retirement July 31, 1984, the seventh Huntsville Division Engineer, Col. John A. Poteat Jr., outlined to Chief of Engineers Lt. Gen. Joseph K. Bratton his vision for the Huntsville Division of the U.S. Army Corps of Engineers.

"I believe it is vital for the success of the Corps to have a specialized division like Huntsville," he wrote. He listed three reasons: "to function as a central manager or one face of the Corps in managing large geographically centralized programs …; to serve as a high technology center of expertise…; and finally, to take on execution of special rapid response, complex missions."

Col. John A. Poteat Jr.
October 1980- July 1984

The division had indeed assumed a larger role in the Corps as a whole. Since he took command in 1980, the division had doubled its mission set.

These missions included extremely complex design and construction programs such as the Munitions Production Base Support Construction Program and Chemical Stockpile Disposal Program; specialized engineering projects related to energy conservation, environmental restoration, physical security, and other areas; international procurement of technical equipment; and national programs supporting Corps of Engineers documentation, information systems, and training.

As the division grew in technical knowledge, the Headquarters of the Corps of Engineers (HQUSACE) repeatedly named the division as a center of expertise, a special designation indicating technical or management expertise in an area beneficial to the Corps community.

By 1987, it had assigned the division as center of expertise in 13 areas – half of all such centers created by the Corps. It was recognition of the value the division continued bringing to the Corps. [1]

The election of President Ronald Reagan brought several changes to the mission of the Huntsville Division. Calling the Soviet Union the "evil empire," the president proposed a near doubling of defense spending to $1.7 trillion over five years.

Although Congress approved only part of this request, it approved a large increase nevertheless. Most of this went initially to building up offensive forces and technologies, but efforts to plan for potential mobilization and improve civil defense also greatly increased.

Division missions focusing on installations and facilities received considerably more support than those involving civilian agencies without missions in these areas. The division grew from fewer than 400 employees in 1982 to a peak of 472 in 1985.

After 1984, its total funding grew to consistently more than $150 million annually.

More than half of this work originated outside the Corps, such as for the Department of Defense, the Department of Energy, and the Environmental Protection Agency. The days of the division having one or a handful of large systems engineering missions were now far removed. As a result, by 1986 the Systems Engineering Division had downsized and became a branch under the Engineering Division once again. Rather, the Huntsville Division managed more than 20 individual missions with five primary characteristics: programs that were national in scope, required integrated facilities or systems, provided standardization or technology transfer, required centralized management, or supported headquarters. What they had in common was advanced technology. [2]

Mobilization and Facilities Support

A decade into the Munitions Production Base Support Construction Program (MPBSCP), it remained the largest of Huntsville Division missions.

President Reagan had emphasized the need to prepare for mobilization, and in 1982 the Department of Defense initiated a plan to reverse several years of inadequate funding and neglect of modernization of munitions production.

In early 1983, the General Accounting Office (GAO) found shortfalls in Army ammunition plant (AAP) production capability that were 75 percent below mobilization requirements, especially for RDX and HMX explosives used in larger shells and missiles. Further, it found restoration to full production capacity in plants with suspended operations would not be fast or easy.

To address these issues, the Reagan administration requested $433 million for MPBSCP in 1983, more than triple the $125 million budget requested for 1981. Funding declined slightly to $353.9 million in 1987, but it remained far above the levels under President Jimmy Carter.

During the same period, the funding going to the Huntsville Division also increased from $55 million to $112 million annually by 1988, or more than 40 percent of its budget for that year. The GAO continued to find a large percentage of the

projects under the MPBSCP program immature – the Army proposed budgets for construction before engineering plans were complete, prototypes had been developed, or technology had been fully tested. This reflected the general trend of the Reagan administration pushing to complete the projects as quickly as possible. Because of this, the core of the program, which had languished or progressed slowly, now proceeded rapidly. [3]

The division finally completed the largest project under MPBSCP – the Mississippi AAP – in 1984 for a total cost of $493 million. This project provided for multiple facilities to produce 155 mm munitions, including multiple projectile metal parts facilities for $47 million, cargo metal parts facilities for $15 million, and a loading, assembling, and packing area for $15 million.

The Mobile District managed construction, which consisted of $180 million in contracts, and the Huntsville Division handled design and procurement of equipment for the remaining amount. This was the first new AAP constructed since World War II.

In addition, there were several smaller projects at Radford AAP, Virginia; Sunflower AAP, Kansas; Milan AAP, Tennessee; Scranton AAP, Pennsylvania; and Louisiana AAP. Two other major projects originated at this time. One was the construction of containerized distribution facilities to process empty containers at several AAPs.

By 1988, the division had one under construction, two ready for bid, and six in design. A second effort involved expansion of RDX/HMX production. At the time, Holston AAP, Tennessee, was the only plant capable of producing RDX and HMX, but its capacity was less than half of that needed for mobilization.

In 1983, the Army estimated it would take eight years and $800 million to design and build a new plant. It developed a plan to construct four new AAPs in Louisiana, Illinois, Indiana, and Iowa specifically to produce RDX and HMX.

In 1986, the division awarded a $15 million design award for a Louisiana RDX/HMX plant with an overall $360 million appropriation.

In addition, the division assisted in planning a new plant at an undisclosed location using the MUSALL process for producing HMX. Under the Bachman process used at Radford, HMX is a by-product of RDX production, but the government had been developing a new process since 1978 to directly produce HMX with less waste and pollution, including experiments at Longhorn AAP, Texas. This would become a critical effort the following decade. [4]

In 1981, the Huntsville Division first became involved in the Department of the Army Facilities Standardization Program in support of mobilization.

After Congress passed the Metric Conversion Act of 1975 (PL 94-168), the Department of the Army began a concerted effort to standardize engineering designs as much as possible. The Vice Chief of Staff for the Army stressed to major commands including the Corps of Engineers the benefits accrued by standardization and the inefficiencies of uniquely designed facilities for each installation.

By 1985, the Army and Corps had formalized the program in Army Regulation 415-15 and Engineer Regulation 1110-3-13. The Department of the Army and the Corps both established Facilities Standardization Committees to review policy and advise on specific design elements. Subcommittees reviewed designs for each type of facility. HQUSACE then established centers of standardization across several districts and divisions to coordinate with subcommittees and develop designs. The level of standardization required varied from buildings with similar space allocations, equipment lists, and utility usage to identical drawings, but engineers retained freedom to adjust the form, shape, and appearance of buildings to match others on an installation.

In 1981, the Huntsville Division first became involved in the Department of the Army's Facilities Standardization Program, but by 1985 played an integral role in reviewing specific design elements for each type of facility, such as at the Bassett Army Community Hospital at Fort Wainwright, Alaska, and the fitness center at Fort Benning, Georgia.

(Photos courtesy of Huntsville Center Historical Archives)

HQUSACE assigned the Huntsville Division as center of standardization for 16 facility types, the most of any in the Corps, with facilities ranging from sports fields to storage igloos. It also appointed the division as the central repository and distribution center of all Army standard designs.

In 1986, HQUSACE added standardized designs of child development centers in six sizes, and in 1987 it added fire stations, physical fitness centers, ammunition magazines, barricades, and classified storage vaults. The designs developed by the division were highly innovative and became standards for future child care centers. [5]

A major early effort within the standardization program was developing standardized designs, criteria, guide specifications, and engineering manuals to support additional troops and equipment at all Army installations in the case of mobilization.

In 1981, the division began updating these "M" designs to replace outdated "E" or emergency designs. Under the Corps of Engineers Mobilization Planning System, published initially in 1984, the district responsible for construction on a base would coordinate with the installation to develop requirements and then work with the district that had area responsibility to complete plans and begin pre-mobilization construction. Some construction was necessary before mobilization to provide a transportation or utility infrastructure, although the Corps would build facilities such as barracks only after mobilization, when the need arose.

Prior to this facility planning, however, it was necessary to develop standardized designs for many of these facilities. The division awarded multiple contracts in four phases.

In Phase I, the division awarded two contracts worth $8.7 million in fiscal year 1982 to develop designs, guide specifications, and manuals for the five highest priority facilities, which it followed by the end of the year with another contract to develop 45 other designs, including barracks, dining facilities, and administration buildings. All of these were complete by mid-1983. Phase II involved the design of 59 temporary structures, and Phase III added another 39 temporary structures. Of these, the division completed two designs – for operating room surgery units – in-house, with the rest completed by contractors.

Phase IV involved design of mobilization production and support facilities for the Army Materiel Command. The division had completed the first three phases by the end of 1987 with Phase IV ongoing on an as-needed basis. [6]

The Army Facilities Components System (AFCS) was another program critical for mobilization. It provided standardized designs and parts lists for emergency construction of various facilities that met both operational and contingency requirements. The Army would use the designs and equipment lists to rapidly build facilities if mobilization became necessary.

The division maintained four technical manuals focusing on facilities for temperate, tropical, frigid, and desert climates. To keep this data current, the division conducted an annual review of all data and tables of equipment and then contracted updates.

In 1982, the division completed six projects with 12 others running into 1983.

In 1984, the division conducted a major program review in which it developed detailed scopes of work and schedules to incorporate newer technologies for rapid construction and arranged periodic exercises of the system. Another focus was on automating this data by populating a Corps-wide database. The budget for the program remained steady at $1.3 million from 1982 to 1987, at or roughly around 1 percent of the division's budget.

In 1988, however, the budget dropped by more than a quarter, leaving the division unable to support 11 scheduled contracts. As a result, it had to reprioritize the effort.

The division's work on guide specifications, which HQUSACE assigned it in 1978, also supported mobilization since many of the guides involved new installation facilities. The division continued to update specifications and technical manuals. These were specifications for every type of structure the Army built.

The goal was to review every manual within three years and ensure that no date on a manual was older than five years, which required review of at least 20 percent of all manuals each year. Funding increased after 1982 from $1.6 million to $2.6 million annually.

In 1982, the division completed 106 guide specifications, 21 technical manuals, and two guide designs, of which 75 were related to military construction and 54 were for Army Reserve Centers. Most of this work was contracted – the division completed 36 guides in-house.

In 1986, the division submitted 103 manuals for publication and issued 398 notices. [7]

Some facilities programs managed by the Huntsville Division supported mobilization indirectly. One of these was the Training Range Program, for which the division became the center of expertise in 1981. Funding for this program grew to $5.5 million annually, or about 12 to 28 labor-years.

By 1984, construction had started on the standardized ranges the division had developed for military operations in urban terrain (MOUT), basic marksmanship, and multipurpose infantry at Forts Hood and Bliss, Texas; Fort Riley, Kansas; Fort Bragg, North Carolina; and Fort Pickett, Virginia. Based on these prototypes, the division published manuals and developed computer software and graphics for range design.

In 1986, the division improved several of these designs based on lessons learned after completion of these ranges. After 1985, it began to add other range designs.

In 1987, HQUSACE named the division as the Mandatory Center of Expertise for the Army Range and Training Lands Program. A mandatory center of expertise was a center with which Corps districts were required to consult for a specific program.

The division was also the Technical Center of Expertise for the Railroad Improvement Program, which was also critical for mobilization planning since many unused railroads would be necessary to move equipment. Under this program, the division provided central management, but local districts executed all design and construction contracts.

Although the program struggled initially with deficient funding, it eventually grew to a $22 million effort. The program involved rails and railheads on 31 installations, but this declined to 23 in January 1982 – 11 for the U.S. Forces Command (FORSCOM) and 12 for the Training and Doctrine Command (TRADOC).

The first phase involved eight installations in Savannah, Kansas City, Omaha, Seattle, and Fort Worth Districts, and the division issued $8.9 million to start work on five design contracts.

The same year, ultrasonic testing on 18 installations revealed defects in 97.4 additional miles of track. Unfortunately, the Army reduced funding to cover only a single installation – Fort Riley – in 1982, and the districts shelved the other completed designs. Finally, the Army released the funds in 1984, and the program greatly expanded.

By 1987, the division had overseen completion of 24 criteria documents, 17 designs, and award of 12 construction contracts. Work on 23 installations was complete by 1985, but it planned even more. For example, the division purchased blocking, bracing, packing, crating, and tie-down equipment needed for railway operations. It also increased training offered on railroad construction and repairs. [8]

The Huntsville Division also supported a major civil defense project during the 1980s – construction of key worker blast shelters for the Federal Emergency Management Agency (FEMA).

Civil defense had always been a major focus of FEMA, but under President Reagan civil defense funding requests had increased from $120 million in 1981 to $252 million in 1983 in order to overcome the large disparity between U.S. and Soviet civil defense spending. Although Congress approved only $190 million, it was the largest increase in civil defense funding since the 1960s.

Initially, FEMA had adopted the Carter administration policy of crisis relocation, in which key workers in target cities would be relocated to shelters to enable defense industries to continue after a nuclear attack.

Later, Reagan added improved shelters, emergency operations centers, and broadcast station and industrial protection, but key worker blast shelters remained important to his strategy.

In 1982, FEMA requested Corps support with developing the shelters, and the Chief of Engineers assigned the mission to the division with support from the Waterways Experiment Station (WES) and the Fort Worth District. WES would research design methods and test them for nuclear weapons effects, the division would develop and analyze shelter designs, and the Fort Worth District would build prototype shelters.

The end products were standardized designs for both permanent and portable shelters. Starting with $412,000 in funding, division efforts rapidly increased to $4.9 million by 1984.

The division produced the first design in 1983 for a dual-use 100-person permanent shelter – that is, it could be used both for emergencies and daily operations.

However, FEMA requested more austere designs for 25, 50, 500, and 1,000 persons that eliminated reliance on outside utilities and dual-use design elements without compromising performance. The Fort Worth District built and the division tested these new designs at White Sands Missile Range, New Mexico.

FEMA also requested new family-sized portable or temporary 15- and 18-person shelters powered by gasoline generators. The division completed and tested the designs in the Dallas-Fort Worth area. The division completed and submitted the final designs in 1988 and 1989, with a revised version completed in 1990.

Labor-years worked on the project ranged from 1.7 to 5.1 annually, but with the end of the Cold War after 1989, the project declined and then rapidly ended. [9] Other facility missions had little to do with mobilization but did contribute to military readiness.

In late 1981, the Joint Chiefs of Staff had tasked the Corps of Engineers with upgrading and modernizing the power grid for critical command, control, and warning systems.

On January 8, 1982, HQUSACE tasked the Huntsville Division with managing the Power Reliability Enhancement Program (PREP), supported by the Facilities Engineering Support Agency (FESA) as the technical and financial lead.

In Phase I, FESA would complete surveys of each site and identify requirements, and the division would complete engineering designs in-house or using contractors.

In Phase II, the division would oversee site-specific designs and construction managed by the local districts and divisions, coordinate joint construction, and develop long-term criteria and design manuals.

The Joint Chiefs of Staff selected six sites for evaluation of PREP: the National Military Command Center at the Pentagon; the Alternate National Military Command Center at Fort Ritchie, Maryland; the North American Aerospace Defense Command (NORAD) at Cheyenne Mountain, Colorado; Continental U.S. (CONUS) Ground Station at Buckley, Colorado; and the PAVE-PAWS radar sites at Otis Air Force

Base, Massachusetts, and Beal Air Force Base, California.

In 1982, FESA provided the division $1.8 million, and the division awarded two contracts to provide surveys, analyses, and plans for the eastern and western sites, which were complete by November. The Joint Chiefs added 24 more sites for PREP through 1988, including some in Greenland, Germany, Japan, the United Kingdom, and South Korea. Evaluations for all but three of these sites were complete by February 1988.

In the interim, the division also completed the initial draft chapters of a design manual in 1983 with the final copy approved in 1986; the division revised the manual in 1987, and the Corps published it in 1988. A major effort within the program was the development of an uninterrupted power supply (UPS) and high-altitude electromagnetic pulse (HEMP) hardness, which the division designed as part of the Alternate National Military Command Center in 1982.

For design purposes protection against high-altitude nuclear explosions was the same as EMP protection since a HEMP event was a worst-case scenario for ground-based facilities.

The division completed hardness testing in November 1985 and the Baltimore District completed all work on the site in 1986. After funding of PREP reached $5 million for 5.8 labor-years of effort in 1986, it gradually declined to less than $400,000 for 2.9 labor years by the end of 1987. [10]

A major outgrowth of work on the PREP program was EMP and TEMPEST hardness design and testing. The division had been involved in hardness testing since its SAFEGURD days, and it had gained recent experience in work on PREP and for the Communications Systems Command.

As a result, in 1984 HQUSACE named the division the Mandatory Center of Expertise for EMP/TEMPEST. EMP is a harmful electronic signal caused by radiation that can interfere with electronics, while TEMPEST was the code name for a program to prevent electronic signals escaping from computer and communications equipment that can be reconstructed to gain intelligence.

"The TEMPEST problem is nearly the inverse of the HEMP" or EMP event, a 1990 Corps pamphlet declared. Thus, the effort involved protection of sensitive equipment both from external power surges and accidental internal emanations.

Designs typically looked at electromagnetic interference such as generators, antennas, magnetic fields, vibration, and acoustics and protected against them using surge protection, shielding, grounding, and even foundation selection. The Advanced Technology Section of the Engineering Division led this effort.

Between 1984 and 1987, the center supported various projects for seven customers, including two outside the U.S., at a funding level of $1.65 million.

By 1988, it had completed a major project at Fort Meade, Maryland, had projects at WES and in South Korea under construction, and had issued a construction contract for a fourth site in the U.S. in July 1987. [11]

By 1983, work on intrusion detection systems (IDS) had blossomed into a new and growing mission area. These systems included devices such as closed circuit television, infrared cameras, motion sensors, glass-break sensors, automated lighting, card-accessed doors, and similar devices. The mission was later renamed electronic security systems to differentiate from network IDS that became popular after 1990.

The division had completed work on physical security systems for the Army Communications Agency in Europe in 1981 and had developed state-of-the-art security systems for a Defense Nuclear Agency nuclear storage test facility at Fort McClellan, Alabama, in 1983.

Ordinarily, installation engineers were responsible for IDS systems. When the Seneca Army Depot, New York, installed an IDS that failed to take into account environmental conditions needed for sensors to work, leading to cost overruns, the Mobility Equipment Research and Development Command requested that the Corps correct the issue.

Following the model developed for energy and other areas, HQUSACE officially named the Huntsville Division IDS Mandatory Center of Expertise in December 1983 and requested a management plan by October 1984.

Eventually, the Corps cemented the center's role in Army Regulation 190-13 and Engineer Regulation 1110-1-8182. The center was not fully operational until 1985, and the mission started slowly due to inadequate funding, but by 1986 work was picking up as the division gained responsibility for designing IDS at Johnson Atoll, 12 military installations, and six chemical weapons storage sites and 14 ammunition storage sites for the Army Materiel Command, as well as several projects for the U.S. Navy.

Its earliest high-profile mission was providing security for the 1984 Olympics in cooperation with the Los Angeles District.

In late 1986, the division signed a memorandum of agreement with the product manager for physical security to support IDS installations for 100 military installations worldwide, and HQUSACE directed the division to begin surveys at 20 installations by the end of 1987.

At four installations, the division worked with the Omaha District, which was the Technical Center of Expertise for Protective Barriers. These included projects at Fort Benjamin Harrison, Indiana; the 1987 Pan American Games; and Chief Joseph Dam, Washington. The workload was so extensive, the division added three additional full-time spaces by early 1988. [12]

Expansion of the Energy Mission

For the most part, the Huntsville Division's energy research support had ended. Most of its energy-related work during the

By the mid-1980s, the Huntsville Division's evolving mission included removing excess facilities from installations, such as the heat plant shown here at U.S. Army Reserve Weldon Spring Training Area, St. Charles, Missouri. ***(Photo by North American Dismantling Corp.)***

1980s focused on energy conservation, which closely aligned with its other facility support missions.

One such program was the Energy Monitoring and Control System (EMCS), a set of automated utility systems that monitored, remotely controlled, and provided standardized management of energy use.

Tasked to support the program in 1979, the division had completed a technical manual for installation of the systems by 1982, but review of the tri-services specifications for the program in 1984 resulted in 21 changes to the technical manual. The primary change was a shift from prescription- to performance-based management, that is, management to reduce actual energy use rather than to meet a specific goal.

In 1986, a joint committee reviewed recommended updates to the technical manuals and design software, and in 1987 the division held several industry forums in the U.S. and Europe to obtain architect-engineer input.

The Navy finally published the much-requested guide specifications in 1988. In the meantime, the division had continued to provide technical support to districts designing and installing the system.

A major part of the division's responsibilities was conducting training. The division had developed Corps training on the systems by 1982, and it conducted five EMCS design courses per year from 1982 to 1984. Training remained a critical part of the division's responsibilities because of the high turnover of trained personnel, which hampered successful implementation of the complex systems. [13]

The division's largest energy mission at this time was the Energy Engineering Analysis Program, which sought to increase energy conservation on military installations by including energy-saving technology and structures during new construction or renovations.

A primary requirement for the program was to complete surveys of current energy use based on 1975 energy levels in order to establish a baseline to calculate savings. The division had to oversee energy use studies on 122 installations, 88 outside the U.S.

By 1984, work on the program had reached $60.7 million annually, and the division working through local districts had completed all base-wide surveys by the end of 1987.

A sub-program established in 1983 was Savings Opportunity Surveys, which focused on energy projects for specific facilities versus entire installations. This required additional or expanded surveys. The division conducted the first surveys of installation hospitals in 1983 under six contracts.

Over the next five years, contractors surveyed boilers, chiller plants, dining facilities, laundries, industrial facilities, post exchanges, and other buildings.

In 1988, the division added surveys of two Army Reserve Centers in Texas as test cases, which proved so successful that it scheduled 13 new surveys.

Another sub-program involved conversion by 1995 of installations using gas-based generators to more efficient solid fuels such as coal to save energy.

In 1981, HQUSACE made the division Technical Center of Expertise for the Solid Fuel Conversion Program, and the division provided technical advice to districts on adoption of clean coal and other fuels.

By 1986, there were 16 projects in planning. Three of these were in very advanced stages of design at Redstone Arsenal, Alabama; Red River Army Depot, Texas; and Fort Bragg, North Carolina. The others were in early stages of programming and became victims of the financial issues that dogged the program. Constrained in funding, HQUSACE continually sought cost reductions in the program.

By 1986, Congress was considering the use of contracted power for all military installations to save money, and all of the projects were placed on hold. Despite this, the Energy Engineering Analysis Program proved immensely successful overall.

By 1985 the Army exceeded the 20 percent savings goal for existing facilities. As a result, the Assistant Secretary of Defense extended the goal to 28 percent by 1995. Two division employees received awards from the Army Deputy Chief of Staff for Logistics for their work. [14]

The Huntsville Division became involved in two new energy programs after 1982 involving contracting.

The Military Construction Consolidation Act of 1982 (PL 97-214) authorized the Army to enter into long-term third-party contracts to provide, maintain, and operate utilities on military installations in an effort to privatize energy use using alternative energy sources, such as solar, biomass, or geothermal. The third party was the owner-operator versus the government or financier.

In 1983, HQUSACE designated the division as the Center of Expertise for Third-Party Energy Contracting. Within seven months, the division had prepared a management plan, distributed a guide to interested parties, surveyed major installations, selected an architect-engineer firm to provide technical support, and prepared an example request for proposal.

Chief of Engineers Lt. Gen. Joseph K. Bratton stated he was pleased in the way the division assumed the mission in an "abbreviated timeframe."

Ten installations expressed interest in the program, and the division advertised requests for proposals and evaluated received proposals to recommend one as a pilot project to the Department of the Army.

By 1985, the division had received $1.5 million in funding; it received less than $1 million annually through 1988 to support contracting efforts. Because of legal issues arising from a contract provision allowing termination at the convenience of the government, the division had to delay an award to build a biomass heating plant at Fort Leonard Wood, Missouri. Instead, a heating plant at Fort Drum, New York, became the first project. The installation awarded the contract November 10, 1986.

The division followed this with projects at New Cumberland Army Depot, Pennsylvania; Picatinny Arsenal, New Jersey; and Detroit Arsenal, Michigan.

In the Military Construction Authorization Act of 1986 (PL 99-167), Congress expanded the program to include non-energy-related facilities, such as wastewater treatment plants, depot activities, and child care services. HQUSACE named the division as the assigned responsible agent for conducting studies and contract negotiations for wastewater treatment and processing plants.

In 1988, the division received $250,000 in funding for its first contract, a wastewater treatment plant at Redstone Arsenal, Alabama. [15]

In 1984, the division became involved in the Shared Energy Savings Program, which proved its most successful energy program. This program encouraged contractors to operate or build facilities more efficiently by sharing energy savings with the contractor. Therefore, the program heavily involved the Contracting (formerly Procurement) Division.

Like other energy programs, it required a baseline of prior energy use established through surveys to determine the savings. The Navy was initially the lead tri-services agency, but the Huntsville Division helped develop the contracting methods through studies at six pilot projects in 1984 at Corpus Christi Army Depot, Fort Bliss, and Fort Sam Houston, Texas; Fort Bragg, North Carolina; Fort Shafter, Hawaii; and Fort Eustis, Virginia.

In each, contractors making renovations of chillers, hospitals, or other facilities would use more efficient engineering practices in order to receive a portion of the savings. Because of their success, Congress authorized the program in April 1986 in the Consolidated Omnibus Budget Reconciliation Act of 1985 (PL 99-272).

By the end of 1987, the first solicitations under the program were pending at Corpus Christi Army Depot, Fort Bliss, Fort Bragg, Fort Shafter, Fort Eustis, and White Sands Missile Range, New Mexico. The division awarded the first contract at Corpus Christi September 7, 1988, to Way Engineering Company of Houston, which received 68.6 percent of energy savings over 25 years, estimated at $7.5 million. The government saved $3.5 million. [16]

Environmental Missions

By the end of the 1980s, the Huntsville Division had mostly completed the requirements of the Army Pollution Abatement Program (APAP). This was the program established after passage of the Resource Conservation and Recovery Act (RCRA) as Public Law 94-580 in 1976 to ensure proper storage and monitoring of hazardous materials.

In 1982, HQUSACE named the division Mandatory Center of Expertise until the end of the program. As mandatory center, the division was the central manager of the program and had authority to assist the districts, which had primary responsibility for pollution abatement projects on military installations. It was one of the largest division programs during the early 1980s.

"Huntsville could have become the Environmental Division if we had wanted to. Needless to say there were a lot of people in Huntsville Center that weren't interested …. So we gave away most of that program," said John Matthews, who later served as Director of Programs and Technical Management.

By 1982, the division had overseen completion of 248 pollution studies on military installations for a total cost of $4.9 million. These studies had led to numerous abatement projects. Districts had completed 155 projects for a total of $360 million by 1982.

After this point, funding declined considerably, and several projects were merged or eliminated. Despite this, APAP projects were able to bring 100 of 116 installations into compliance by 1984.

Another requirement of RCRA was to establish groundwater monitoring at all locations storing hazardous material. The primary agencies the division supported in this effort were the Army Materiel Command and the Defense Logistics Agency, which oversaw ammunition and fuel, respectively. Based on earlier assessments and efforts, groundwater testing started in 1982.

In 1982, HQUSACE tasked the division to oversee Army Material Command ground water assessments and to review designs of corrective actions where contamination existed. Although funding was initially only $3 million, it grew to $12 million annually by 1986. By that time, the division had prepared audits of 65 military installations. [17]

In 1981, the Huntsville Division also started supporting what would become the Defense Environmental Restoration Program (DERP), which was one of the longest-running environmental programs.

In 1980, Congress had passed the Comprehensive Environmental Response, Compensation, and Liability Act (Public Law 96-510), which required cleanup of documented polluted sites and provided a "Superfund" to pay for mostly civilian sites identified and prioritized by the Environmental Protection Agency.

Initially, however, cleanup of polluted military sites fell under Department of Defense authority and budget. In 1981, the department established the Installation Restoration Program (IRP) to clean up toxic groundwater seeping from active Army installations to adjacent properties.

The U.S. Army Toxic and Hazardous Material Agency (USATHAMA), which managed the program, requested Huntsville Division support in 1981. By that time, the division had already worked with USATHAMA on several other pollution-related issues.

The first contract issued under IRP was at Anniston Army Depot, Alabama, for $5.2 million in 1982 to remove degreasers, cleansers, and other contaminants.

In 1986, the division started work on the largest site to that date at Hawthorne AAP at the request of Nevada and the Development and Readiness Command (DARCOM). The contractor was to clear surface contamination on 943 acres of land. This project was the first involving removal and disposal of unexploded ordnance.

Many military installations had buried or stored ammunition since World War I, and many ranges were unsafe because of unexploded rounds.

There were, at the time, no standards or regulations for unexploded ordnance removal, and the division developed these based on Army regulations guiding explosives and ordnance disposal (EOD) units. Because of the unavailability of military units capable of performing the work, the division turned to civilian contractors, mostly retired EOD personnel, although few companies were doing such work.

During the project, the division determined it was safe to use contractors if personnel were properly screened, there were frequent safety briefings, there was sufficient information about the ordnance, and the contractors were given sufficient time. The division contractor – UXB International – completed the project in about 18 months. It would become a model for future work with ordnance. [18]

A second program the division supported under DERP was the Formerly Used Defense Sites (FUDS) program. In Public Law 98-212 of 1983, Congress created an Environmental Restoration Defense Account of $150 million to clean up formerly used defense sites.

The Department of Interior, which inherited many former military bases as federally-owned parks and lands, identified several hundred sites with pollution and ordnance issues.

In 1984, HQUSACE assigned the division to conduct inventories of the sites and assist with engineering.

The following year, Congress officially created DERP in Public Law 99-190 and placed both IRP and FUDS under the program. The division initially identified 5,630 FUDS sites. With addition of other sites including under IRP, the number of polluted sites grew to 7,500 by 1987.

The process used for the sites included an inventory of all potentially polluted sites, followed by a preliminary site assessment or survey to determine site eligibility, an investigation to confirm pollution locations, an engineering evaluation to identify needed actions, and contracted remediation or construction.

By 1985, the division had completed 895 inventories, of which 112 identified debris pollution and two toxic waste. The division completed roughly 500 site surveys per year, which increased to 2,641 by the end of 1988. Of these, 116 sites contained debris, 56 contained hazardous materials, two contained ordnance, and 539 did not have any pollution present and therefore did not require remediation.

However, the confirmation studies and engineering evaluations took much longer. Only 26 confirmation studies were underway in early 1986. That year, the division decided to decentralize the confirmation and engineering studies, allowing the districts to complete them.

By late 1987, 175 confirmation studies were underway and 39 were complete. By that time, contracted engineer evaluations of 23 sites were underway, plus investigations of former NIKE missile sites. [19]

In 1985, the Huntsville Division picked up a new environmental mission under DERP – support for the Defense Logistics Agency. That year, the Defense Logistics Agency signed a memorandum of understanding with the division to support groundwater quality and remediation efforts at agency depots where the agency stored ammunition and fuel among other items.

Through 1988, the division spent $3 million on assessments and remediation projects at seven depots, one of which – the Defense Depot Ogden, Utah – was deemed one of the most hazardous sites in the U.S. due to the presence of mustard gas in the soil from chemical weapon production dating back to World War II. Remediation at this site was far advanced by 1988.

The division also supported the Defense Logistics Agency through remediation of Defense Reutilization and Marketing Service (DRMS) facilities. The DRMS was responsible for the disposal of former military equipment and required temporary storage of some hazardous wastes.

According to RCRA and other laws, any hazardous material stored longer than 90 days required special handling.

In a 1985 memorandum of agreement, the Defense Logistics Agency made the division responsible for all DRMS storage sites nationwide. By the end of 1987, the division had produced specific designs for 57 projects using 48 standard building designs and had awarded six of these projects for construction. [20]

Chemical Demilitarization

By 1982, the chemical demilitarization program had already made great strides. Efforts were underway at Tooele, Utah; Pine Bluff, Arkansas; and Rocky Mountain Arsenal, Colorado. The Chemical Agent Munitions Disposal System (CAMDS) at Tooele – the first industrial plant designed to destroy chemical weapons in bulk – came online in 1979 and had started destroying weapons.

Unfortunately, as a prototype its capacity was limited. Pine Bluff Arsenal was the primary location for storage of BZ, an incapacitating agent that causes stupor, hallucinations, and loss of muscle control. The arsenal stored 637 tons of BZ, including 10,000 bulk pounds, 80,000 pounds in weapons, and additional contaminated material from production of the agent before 1960.

USATHAMA had become responsible for disposal of the stockpile in 1976, though there was not a process to eliminate BZ at the time. The agency completed studies from 1978 to 1981 and had started design of a disposal facility in 1981.

That year, USATHAMA requested engineering and contracting support from the Huntsville Division to research and design a new CAMDS plant at Tooele and to also develop a prototype Johnston Atoll Chemical Agent Disposal System (JACADS) plant using an automated process to destroy stockpiles of U.S. chemical weapons previously shipped from Japan to the Pacific island.

In 1982, USATHAMA modified the agreement to include the BZ disposal plant at Pine Bluff Arsenal.

At Rocky Mountain Arsenal, the Army continued to use chemical disposal means, which were much less effective in removing all agents. It had ceased to be an active facility by 1988, but pollution issues resulting from demilitarization were a major problem.

While the Corps had no involvement in disposal, it was involved in the base cleanup. Several other manual processes were in use at other chemical weapon stockpile locations, but their capacity was very low. [21] The division immediately started development of the plants.

In August 1982, the division issued a Phase I criteria development and design contract to the Ralph M. Parsons Company for the JACADS facility. The division jointly managed the contract with the Pacific Ocean Division, with whom it had entered a memorandum of understanding earlier that year.

The design was 90 percent complete by 1984. The 73,000-square-foot facility would use automated systems including computerized controls, closed-circuit television to monitor activities, and robotics to handle and dispose of the weapons remotely using the most current incineration technologies and safety controls.

Phase II, which included site preparation and construction, began in 1985, for which the Huntsville Division received $10 million to manage. The total value of the contracts for this phase was estimated at $74 million. The division also awarded a $50.5

million contract to procure and install equipment to Stearns Catalytic Corporation of Colorado.

In the meantime, the Pacific Ocean Division awarded a $32.8 million contract for construction of the facilities in September 1986.

At Tooele, the Huntsville Division awarded three contracts for Phase I research and development in 1982 for $2.4 million over eight months. It followed this with a 22-month Phase II contract to build a laboratory demonstration of the process that would guide the final design.

However, the design was still not complete when construction started in 1989. Contracting efforts also started for the Pine Bluff BZ disposal plant in 1982.

While the Tulsa and Little Rock districts issued the design and construction contracts for the Arkansas plant, the Huntsville Division issued a $42 million contract to procure and install equipment.

By 1987, construction was 99 percent complete, and the plant began operations May 9, 1988. This plant, as with others developed at this time, used the so-called "baseline" process, in which workers would move the munitions manually from a bunker to the plant, where robotics would drain munitions and disassemble them. Conveyor belts then transported parts to incinerators, and a pollution control system cleaned exhaust and remaining brine and charcoal. [22]

By 1988, USATHAMA had finalized a national disposal plan.

In 1983, the Undersecretary of the Army tasked the Board on Army Science and Technology to review the disposal technology, the urgency to dispose of each weapon type, and the risk to public health.

Not long after, Congress required in Public Law 99-145 (1985) for the Army to develop a national plan to dispose of all chemical weapons. The report submitted in 1988 compared three plans: moving all weapons to a single facility for destruction, transporting them to facilities in each region, or destroying the weapons in place, including at Johnston Atoll.

Although destroying weapons in place was costly at an estimated $1.2 to $2.2 billion, it was far safer, less complicated, and less expensive than the other two plans. Movement of munitions would require construction of additional storage facilities as well as increased monitoring. Yet the main problems were political.

By 1986, Kentucky and several other states had passed laws greatly restricting movement of chemical weapons. This was in addition to the widespread public concern about the very real possibilities of spills. The preferred course of action presented by USATHAMA was on-site destruction. This was partly because, as the Office of Technology Assessment noted, the Army believed "any accident on an existing Army base would be easier to mitigate than an accident at some unknown point along a transportation route."

In February 1988, the final environmental impact statement supported this decision. The result of this plan was the creation of a consolidated Chemical Stockpile Disposal Program (CSDP), jointly operated by the Army and FEMA. The program included disposal facilities at nine sites, including the new CAMDS and JACADS facilities, although there was still considerable opposition to the plan from Kentucky, Maryland, and other states.

The plan set a 1994 deadline for disposal with destruction set to start at the other locations by 1992.

After disposal, the Army would dismantle the facilities. The Huntsville Division started designs of the other seven facilities at Aberdeen Proving Grounds, Maryland; Lexington and Bluegrass Army Depot, Kentucky; Anniston Army Depot, Alabama; Newport Army Ammunition Plant, Indiana; Pine Bluff; Pueblo Depot Activity, New Mexico; and Umatilla Depot Activity, Oregon.

By early 1988, HQUSACE had named the Huntsville Division as the Program Execution Agent and established a support construction cell in the South Atlantic Division by memorandum of understanding in 1988. [23]

Software Development

Since 1978, the Huntsville Division had been involved in testing, deploying, and maintaining several computer-aided engineering and design systems (CAEADS).

By 1982, however, the division started developing and expanding the systems to meet new requirements. In 1982, HQUSACE had approved the EDITSPEC software for Corps-wide use, which provided automated editing of project specifications. The division held an initial orientation to the software in which 260 attended, and it provided two training courses in February and March 1982.

By April, 19 divisions and districts were using the program.

Despite widespread use, HQUSACE decided in 1984 to reduce the scope of the program until restructured and modernized based on user input.

The division Engineering Support Branch and Information Management Office coordinated on analysis, programming, and data entry for the program. The smaller module, SPECBASE, eliminated the automated specification generation feature and was accessible through Control Data Corporation's CYBERNET computer network service.

The division also updated the DD Form 1391 Processor software, which it had launched in 1980. Initial use determined that the program was not broad enough and was too expensive to use, so the division conducted a study, updated the software,

and launched the new program in September 1982. The primary change was to port the software to the Tymshare operating system, which caused substantial problems.

By 1983, the division started completely redesigning the system to transform it from a program for HQUSACE to check data on the 1391s to an Army-wide processor to meet broader congressional requirements.

The division reduced the number of blocks to fill out, enhanced functionality, and upgraded from a RAMIS to a FOCUS database. Among features added were support for military construction, munitions production base support, housing, non-appropriated funds, operational maintenance and repair, Post Exchange, and dental funding categories.

By 1987, there were 800 users of the system, which stored 26,000 forms. The problem was that, given the patchwork of changes made since 1980, the system was very complex and difficult to manage.

As a result, in 1988 the division set out to modernize the program, rewriting significant portions of the code. It contracted the Idaho National Engineering Laboratories to assist in this task. [24]

Col. Rudolph E. Abbott
July 1984 - February 1987

In 1982, HQUSACE assigned the Huntsville Division as responsible agent for the Computer-Aided Cost Estimating System (CACES).

CACES was a system that collected cost data to prepare more accurate cost estimates for construction projects. It included cost analyses, historical data, time savings, management data, and used multiple cost-estimating techniques. CACES was originally developed for use outside the continental U.S., but HQUSACE requested its adaption to CONUS requirements once its effectiveness became evident.

The division participated in prototype testing, aided with expansion and enhancement of the program, and made numerous suggestions to improve it. In general, the division found that it was easy to make changes and transmit data with CACES, and its use of standardized data formats and cost-estimating tools was a plus. Nevertheless, the division recommended creation of a generic database to store data and several other changes.

In 1982, the division issued five contracts valued at $350,000 to update the system and develop a new database. By the end of the year, the division brought two districts online to test the system.

By 1983, 20 districts and divisions were using the system, and the division implemented the program at 46 others over the following months. Despite these successes, Corps use of the system had not reached its full potential as late as 1987.

As with many businesses, the Corps was transitioning away from minicomputers using a distributed computing model with a central processing unit and multiple terminals toward microcomputers (personal computers or workstations) in which most processing remained with each individual terminal. [25]

The division assumed responsibility for a third suite of software programs in 1984 when HQUSACE reassigned ECONPACK to the division. This was another software system developed by the Corps Construction Engineering Research Laboratory (CERL) with the assistance of the Pacific Ocean Division.

The system allowed users to prepare lifecycle economic analysis reports. It operated on the Military Construction (MILCON) Programming, Administration, and Execution (PAX) computer system housed on a mainframe in St. Louis, which was accessible through a dial-in network capability. It was one of the most successful software systems the Huntsville Division managed.

By 1986, there were more than 500 agencies using ECONPACK for construction programming, administration, and management. Its users included the Department of the Army, the Army Audit Agency, the Office of Management and Budget, and the Office of the Secretary of Defense. Nearly all military users worldwide could access it. In 1986, CERL completed a version of ECONPACK for the personal computer.

By the early 1980s, IBM had introduced standalone microcomputers with a standardized Microsoft operating system, and many agencies had started to purchase these computers to run programs such as spreadsheets and presentations. The personal computer version of ECONPACK provided full-screen editing and did not require a connection to PAX to operate.

On receiving the program in 1986, the Huntsville division corrected bugs in the program and submitted a management plan to maintain the application the following year. [26]

Technology Procurement

After years of procuring equipment for SAFEGUARD, the U.S. Postal Service, NASA, Army Materiel Command, and several Middle Eastern nations, the Huntsville Division had earned a reputation for procuring complicated equipment in short timeframes.

Even before the Middle Eastern missions had ended, the Office of the Surgeon General contacted the division in 1981 to request support with procurement for Army Health Care Facilities. The Surgeon General sought standardized designs for military hospitals and clinics and was responsible for selecting and ordering components. These components ranged from furniture to medical equipment, some of which was very complicated to order.

Since the division had gained experience ordering similar equipment for Saudi Arabia, it seemed a natural fit for Contracting Chief Ray Aldridge, who led efforts to support the program.

Although the division did not sign a memorandum of understanding with the Surgeon General until 1982, the division agreed to support procurement on a case-by-case basis.

The first such requirement came when the U.S. Army Medical Materiel Command at Fort Detrick, Maryland, requested support in February 1982 obtaining furniture for multiple medical facilities, starting with a $100,000 furniture procurement for a dental clinic at Heidelberg, West Germany.

The command then worked with the division to revise furniture specifications using a hospital at Fort Stewart, Georgia, as a prototype. The division ordered $1.5 million of items.

From the time the memorandum of understanding came into force until 1984, the division ordered some 2,321 items costing more than $4 million for 17 facilities in Germany, two in Korea, and seven in the U.S., including items ordered for Fort Campbell, Kentucky; Fort Ord, California; Fort Benning, Georgia; and Fort Rucker, Alabama; all from April to August 1984. The volume increased to more than $9 million by 1987.

In March 1984, the Surgeon General entered into a new memorandum of understanding with the division to expand the list of supported items to include medical equipment such as sterilizers, x-ray machines, acoustical rooms, and surgical lights for renovation of Army health care facilities.

By the end of the year, the division had ordered 100 different types of items at a cost of $2 million for hospitals at Fort Ord; Fort Carson, Colorado; and Bremerhaven and Frankfurt, West Germany. [27]

By 1983, as division work in the Sinai Peninsula was coming to an end, the Europe Division of the Corps of Engineers requested Huntsville Division support in procuring weapon and security systems.

This initially included the Weapons Access Delay System, a system of barriers and defensive technologies designed to prevent unauthorized access to nuclear weapons.

Among other government-furnished equipment purchased by the Huntsville Division were smoke generators, fire sets, and command and control units for various weapon systems.

By October 1983, the Huntsville Division had purchased 326 items for $3.5 million, and it purchased another 443 items for $2.7 million by 1985.

In a memorandum of understanding signed between the two divisions in 1984, the Huntsville Division agreed to support major construction projects throughout Europe by procuring technical equipment.

The assignment of Deputy Europe Division Commander Col. Rudolph E. "Jim" Abbott as Huntsville Division commander in August 1984 helped to strengthen this relationship.

One such project involved procuring three vapor compressors at $1 million for a desalinization plant at Sinop, Turkey, a joint U.S.-Turkish base on a Black Sea peninsula used to monitor Soviet activities.

By 1987, the division was also supporting the purchase of furniture for Army Reserve Centers, noise pollution test kits for the Army Environmental Health Agency, and additional access delay systems for the Defense Nuclear Agency. [28]

By this time, the procurement of computer-aided design (CAD) systems for Corps-wide deployment was also underway.

Since 1978, the Huntsville Division had experimented with CAD in an effort to digitize master plans for AAPs and finally leased Digital Systems PDP-based CAD equipment in 1981. It upgraded this system to a VAX-based system in 1984, and it purchased the system outright in 1986 after approval from HQUSACE.

After completion of the original pilot project using CAD, the division recommended Corps-wide procurement of CAD in 1982. At the time, there were few CAD vendors, and many bases were developing their own software. An HQUSACE study group, which included division personnel, met in 1984 and recommended the adoption of CAD.

"I believe the Corps' FOAs [field operating agencies] should all have the same system or at least compatible systems to facilitate communications between different offices. I also believe we should consider having equipment that is widely used in the AE [architect-engineer] community," Colonel Poteat said.

HQUSACE agreed and tasked the division to procure the equipment June 25, 1984. Given the novelty of the systems, procurement was a long and complicated process, and several Corps districts were starting to purchase their own systems, which the division feared would lead to piecemeal and incompatible technology adoption.

As a solution, HQUSACE approved temporary leasing of systems until the procurement was complete. The General Services Administration finally approved the procurement January 21, 1986, and after a long selection process the division awarded a $33 million contract to Intergraph Corporation of Huntsville, Alabama, September 4, 1987, to develop requirements.

It followed this with a $122 million indefinite delivery/ indefinite quantity contract, which included $51 million to support Corps districts, $50 million for master planning activities, and $20 million to support mobilization planning.

By early 1988, the division had approved orders worth $20 million to allow 38 Corps and 130 non-Corps offices to purchase the systems. The Huntsville Division was the sixth organization

in the Corps to receive a CAD system, which eventually included 16 workstations throughout the building.

After the acquisition, the division held a meeting in Atlanta, Georgia, to familiarize Corps districts and divisions with the capability and submitted a CAD implementation plan. [29]

Training Technology

Within three years of moving to Huntsville, the Corps of Engineers Training Management Division had outgrown its facilities.

The Huntsville Division had initially leased an 11,500-square-foot facility in north Huntsville, but almost from the beginning it was too crowded. This required leasing other buildings and innovative uses of existing spaces, such as by rotating classes.

Based on estimates in 1979, a building with 30,000 square feet was necessary to support current student numbers. Chief of Engineers Lt. Gen. John Morris expressed a desire for a new facility to be associated with a university, even if it meant moving the training organization again. In response, University of Alabama in Huntsville (UAH) president John Wright proposed a new building at UAH to meet the requirement.

The division studied proposed sites, but it finally agreed a new facility at UAH was the best opportunity. UAH was by then one of the leading technical schools in the country.

In April 1983, the division signed a memorandum of agreement with UAH. Independently, UAH and Huntsville city officials met with U.S. Representative Tom Bevill of Alabama to obtain federal funding for the facility.

In 1983, Bevill sponsored legislation to provide $9.5 million for a new training facility. However, the new Chief of Engineers, Lieutenant General Bratton, thought it more proper for the Corps to fund a facility it would use through tuition costs, although UAH would provide land for the facility.

In the end, UAH and the Corps signed another memorandum of agreement in October 1985 in which UAH owned the building and land, but the Corps had first priority on its use for 50 years and would pay 75 percent of maintenance costs.

"It will improve and upgrade corps training to be living and working on a college campus," division Public Affairs Officer M.R. Stephens said.

Huntsville Division engineers designed the facility. It would include 93,000 square feet. Of this, 35,500 square feet consisted of five classrooms, a lounge, and administrative offices. The rest of the space was for 100 hotel rooms, three executive suites, and a spacious dining area. The most notable feature was a three-story atrium at the entrance.

The Mobile District awarded the construction contract in January 1986 for $6.2 million. The district held the groundbreaking February 26, 1986; it completed the building by the end of 1987; and, after the Huntsville Division procured furniture, the facility opened its doors in January 1988. UAH named it the Tom Bevill Center for Professional Development and Continuing Education in honor of his role in supporting the facility. [30]

The Corps saw exceptional growth in the Proponent Sponsored Engineer Corps Training (PROSPECT) program during this time.

From 1982 to 1987, the number of PROSPECT courses offered grew from 241 to 392, and the number of students trained increased from 7,949 to 12,179. This included mostly Corps employees, but it also included personnel from the Navy and Marine Corps, as well as some foreign students.

In 1982, the Huntsville Division, along with WES, CERL, and North Pacific Division instructors, trained 50 South Korean students.

In 1984, the division trained a group of 11 students from the Republic of China (Taiwan) in coordination with the Bureau of Reclamation. The division continued to maintain the Purple Book of course offerings, but it also added several specialized training courses to meet technical requirements.

In 1982, the division offered a course in geology through the University of Missouri, Rolla, for graduate credit.

To support new environmental requirements, the division added Environmental Protection Agency courses about the Superfund from 1983 to 1987.

In 1984, the division introduced a computer training center and dedicated laboratory with terminals contracted from UAH, which supported computer-aided instruction and courses. In 1985, the division added a commander's course to train incoming district commanders. These made primary use of the executive suites at the Bevill Center. To support these activities, the training division grew to more than 45 personnel by 1986. [31]

The Huntsville Division also made great strides in expanding the Corps of Engineers Nontraditional Systems Training (CONTRAST).

In an age before the Internet, most distance learning capabilities consisted of video-based training, teleconferences, interviews, study or course guides, and exportable training to local facilities. The division also experimented with video teleconference-based training.

Redstone Arsenal had a television studio at the time, and the division attempted a pilot project broadcasting training to five other locations.

Unfortunately, the technology was still not ready to support a nationwide system, and the division suspended the project due to technical issues in 1983. It was not until 1986 that the arsenal installed a satellite system capable of supporting video-

teleconferencing with eight other Army Materiel Command sites.

Nevertheless, the division continued to develop new CONTRAST courses. It had 13 courses by the end of 1987 with another 10 in development. Most of these courses included pre-packed concentrated curricula that presented normal coursework in a brief and exportable format. The Corps had trained 4,000 to 8,000 using these methods by the end of 1987.

Several of the courses were quite good. For example, in 1984 a Blue Ribbon Panel recommended engineers use a construction inspection course offered through the division. However, the most popular after 1983 were a series of courses on mobilization designs.

By 1987, the division offered eight courses in various mobilization-related issues. Each included materials for 25 people and lasted roughly three days. In this way, the Corps was able to train a much larger number of students than could attend classroom training. [32]

Since 1983, the Huntsville Division had gained responsibility for six new centers of expertise, added to the seven already assigned for a total of 13. While some at HQUSACE had expressed concerns that the division would be unable to adequately manage such a large number of diverse technical areas, by the time Colonel Abbott retired in early 1987, the division's centers were held up as "models of Centers of Expertise throughout the Corps."

This was due primarily to the widely recognized technical expertise of the division. Whether in the field of systems design for AAPs and chemical weapon disposal plants, oversight of engineering guidance and documents, management of Corps-wide engineering systems and training, highly technical procurement, or technical guidance for IDS, electronic utility systems, energy conservation, and environmental restoration, the division had earned a reputation of assisting engineers throughout the nation with the most complex engineering problems.

The division had reinvented itself as the primary center of expertise for advanced technology and engineering in support of Corps operations nationwide. [33]

Despite this new identity as the advanced technology center for the Corps, the division returned once again to its roots after 1985. It had continued to support ballistic missile defense research at very low levels, but funding greatly increased as the Reagan administration set a goal of eliminating the threat of nuclear attack. It would do this not only through an improved missile defense program but also through experimental weapons such as lasers and space-based sensors.

Although the division had lost much of its original experience in missile facilities, it had retained expertise in related technologies such as hardening and EMP protection. It would build up its missile defense program over several years. Although missile defense remained only one of many technical programs the division supported, it reinforced the division's identity as the primary center for space-age technology.

End Notes for Chapter 4

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5

Missile Defense Again, 1985-1992

On March 23, 1983, President Ronald Reagan gave what was later dubbed his "Star Wars" speech. The purpose of his televised remarks was to justify increases in the defense budget.

At the end of the speech, however, he called for a new ballistic missile defense (BMD) program, which many hawks in his cabinet saw as a way of moving past the policies of détente and mutually-assured destruction to actually protect people.

While calling on the scientific community "to give us the means of rendering these nuclear weapons impotent and obsolete," Reagan announced, "Tonight, consistent with our obligations of the ABM treaty and recognizing the need for closer consultation with our allies, ... I am directing a comprehensive and intensive effort to define a long-term research and development program to begin to achieve our ultimate goal of eliminating the threat posed by strategic nuclear missiles."

As later explained by the Department of Defense, this Strategic Defense Initiative (SDI) would primarily include ground- and space-based antiballistic missiles, as well as lasers, microwave sensors, and other experimental technologies.

Critics derided the program as "Star Wars," referring to the 1977 science fiction movie, but the name stuck because it captured a futuristic vision that appealed to many citizens.

The Department of Defense would flesh out the SDI over the next year and formally launch its development by 1985.[1]

With this announcement, President Reagan launched a new era for the Huntsville Division in which, for over a decade, BMD came once more to play a prominent role in its future.

The division returned to its roots as a BMD engineering agency, though few of its original employees remained. Reagan and his successor, George H.W. Bush, invested considerable funds in technology development.

Since the programs remained experimental, the funding levels for the Corps of Engineers were never as high as under SAFEGUARD. Yet the program opened the door to support several other space or missile projects, including for the Army Missile Command (MICOM), the Defense Nuclear Agency, and the National Aeronautics and Space Administration (NASA).

In the meantime, the division continued to support an array of high-tech engineering projects. While the Munitions Production Base Support Construction Program was winding down, the Chemical Stockpile Disposal Program saw increasing growth.

The closure of many military installations created new environmental and ordnance removal work under the Formerly

The early eighties fostered in a new era for the Huntsville Division through President Reagan's "Star Wars" initiative which prompted the development of hit-to-kill interceptor technology. ***(Photo courtesy of DOD Archives)***

Used Defense Sites program, and the division supported new projects related to energy conservation, automated systems, physical security, and even magnetically levitated trains. It also continued to support Corps-wide missions including training, guide specification updates, standardization, and mobilization documents.

Yet it was the growing space-related programs and reputation of the division as a space-age agency that drove the work through the end of the Reagan-Bush era.

National Missile Defense

Within a year of President Reagan's "Star Wars" speech, the Department of Defense established the SDI Organization to take the lead on planning the SDI system; in 1985, the Department of Defense created the U.S. Army Strategic Defense Command (SDC) from the BMD Organization. With the growth of other space-based programs, SDC transitioned to the U.S. Army Space and Strategic Defense Command (SSDC) in 1992.

Despite the end of the SAFEGUARD program the previous decade, experimental work on BMD had continued, increasing from $200 million to $500 million under Reagan, although very little of this went to facility engineering. The SDI program thus relied mostly on ongoing BMD research. Only a small number of components – primarily lasers and space-based weapons and sensors – were truly experimental.

As defined by the SDIO, the Strategic Defense System Architecture included both ground- and space-based interceptor missiles, a ground-based sensor (or radar), two space-based sensors, and a battle management system. It designed this architecture to stop incoming intercontinental ballistic missiles (ICBMs) during three phases.

During the boost phase, ICBMs were still gaining velocity and had not yet split into multiple independent re-entry vehicles (MIRVs), and so were vulnerable to weapons that could reach them while still in lift, such as space- and ground-based lasers.

During the midcourse phase, when ICBMs re-entered the atmosphere, there was elevated risk because of MIRVs, but they were still vulnerable to space-based interceptors and exo-atmospheric ground-based interceptors.

During the terminal phase, when missiles were within 10 to 50 miles from their targets, the risk was greatest because of velocity, numbers of missiles, and decoys, but the use of high-speed endo-atmospheric interceptors could greatly increase the cost of attack to the Soviets and reduce the risk.

There remained some dispute about whether to focus on silo or city protection, which "remains the most controversial BMD mission," wrote MIT analyst Ashton B. Carter, who would later become Secretary of Defense.

The initial architecture called for 90 to 100 percent survivability, including cities, but the Phase One design, which the SDIO approved for the Defense Acquisition Board in the fall of 1987, called for an initial 30 percent survivability of military targets only, which it would accomplish through deployment of thousands of ground- and space-based missiles by 1994 for an estimated $40 to $60 billion. [2]

The Huntsville Division began supporting the SDIO and SDC in 1984 by attending planning meetings and conferences, but it did not receive initial funding of $25,000 until 1985. That year, HQUSACE appointed Huntsville as the lead division supporting SDC, although most construction fell within the purview of the Pacific Ocean Division.

The Huntsville Division's primary role was to support research into hardening of facilities and assist with design and construction of test facilities on Meck Island, Kwajalein Atoll; Wake Island, Hawaii; and White Sands Missile Range, New Mexico.

The division's earliest work was on the most difficult part of the program – the Ground-Based Free Electron Laser-Technology Integrated Experiment (GBFEL-TIE). This was a major element of the SDI intended to develop lasers to shoot down missiles, but it was also the most experimental of the technologies.

The SDIO initiated the project in 1984. As the primary Corps liaison to the SDI, the division supported design and construction of the test facilities. The program quickly grew from $25,000 in 1985 to $11.8 million in 1987. After several experiments and conceptual planning, the division awarded a two-phase GBFEL-TIE contract for design and power tests in 1987, which it anticipated would exceed $600 million.

The division selected a site at White Sands, which SDC approved, and it awarded a construction contract to Fluor Constructors in January 1987. The division opened a 16-person office to manage construction.

Unfortunately, the project did not proceed to construction. After spending close to a billion dollars on the system, the newly elected Democratic-majority Congress cut funding on the laser experiment from $26 million in 1987 to $5.3 million in 1988. As a result of the funding limitations, the division was unable to execute the contracts, which ended the project by 1990. [3]

The most critical components of the SDI were the hit-to-kill interceptors, which had increased in accuracy because of the Homing Overlay Experiment.

In fact, because of the heavy criticism of the cost and ineffectiveness of lasers and other experimental components, the SDC dropped most of these by 1992 and focused on the missiles.

The division supported development of radar and missile launch facilities for both the ground-based and space-based interceptors.

The High Endoatmospheric Defense Interceptor (HEDI) provided protection in the lower atmosphere, while the

Exoatmospheric Reentry Interceptor Subsystem (ERIS) provided protection in the outer atmosphere and edge of space. The ERIS used the lower rocket stages of the Minuteman missile with the Homing Overlay Experiment kill technology and was thus the more advanced in design.

The division quickly awarded design and construction contracts for an ERIS launch pad on Meck Island, while the Pacific Ocean Division managed construction. Construction was complete and the SDC first used the pad in 1991 in conducting the first successful launch of ERIS.

By 1990, the Huntsville Division had completed designs and awarded construction contracts for the HEDI launch complex.

The division awarded the design contract in 1989 for the Ground-Based Radar-Test on Kwajalein, which was 60 percent complete by 1992.

The division also completed launch facilities for the Space-Based Kinetic Kill Vehicle (SBKKV, later renamed SABIR) on Meck Island, along with the STARBIRD launch facilities.

NASA developed the STARBIRD rocket to support Star Lab, with launch facilities planned at Cape Canaveral, Florida, and Wake Island, but the SDC and Air Force sought to use the rocket to launch space-based SDI components.

The Huntsville Division assisted with the design of launch facilities at Cape Canaveral, while the Mobile District supported construction.

The Navy handled design and construction of the Wake Island facilities. After completion of the Cape Canaveral facilities in 1990, contractor Orbital Sciences completed the first test flight of the rocket December 17, 1990.

Many other facilities did not come to fruition. The SDC halted the Braduskill Interceptor Concept Launch Complex at the concept stage and canceled the Kinetic Energy Anti-satellite Demonstration Complex when flight tests became unnecessary to collect data. As with most other SDI components, the planned and completed facilities became part of the National Missile Defense Program in 1993. [4]

Other SDI work conducted by the division included feasibility studies, criteria development, design, construction, validation, testing, and lifecycle management of hardened nuclear test facilities and electronics.

Primarily the Defense Nuclear Agency, but also the SDC and NASA, conducted a series of nuclear tests related to the SDI to determine the needed hardness of facilities, satellites, and technology. Division personnel attended numerous meetings, coordinated research and development, and developed documentation.

By 1987, the division was helping develop aboveground, underground, and vehicle test experiments of various technologies, culminating in support of underground nuclear test facilities for the DISKO Electromagnetic Pulse (ELM) nuclear test as part of Operation CORNERSTONE.

This was an underground tunnel built over two years at the Nevada Nuclear Test Site, where various agencies conducted experiments. The division supported the project at a level ranging from $3.5 million to $8 million annually over several years.

The DISKO ELM detonation in September 1989 was one of the last of several series conducted before the U.S. ended nuclear testing in 1992. The U.S. would sign the Comprehensive Nuclear Test Ban Treaty in 1996.

However, even after this detonation, the Defense Nuclear Agency provided $13 million through 1990 for the division to support special studies in ELM, hardness testing, Rail Garrison Basing Mode, and Jam Resistant Secure Communication sites. [5]

Despite the successful development of many advanced facilities, the SDI never advanced as far as SAFEGUARD because of its severe limitations. Like previous BMD programs, the SDI suffered from an urgent schedule that often increased cost by requiring construction to proceed before designs were ready.

Aggravating this situation was the fact that much of the technology was immature – the lasers especially were still highly experimental, and there were many unknowns in completing designs. The political situation also constrained development.

Because the Strategic Arms Limitation Talks (SALT) Treaty limited implementation of a BMD, the U.S. could not deploy the system without leaving the treaty, which would open the door to increases in nuclear warheads and missiles. This created enormous difficulties with the Soviet Union and domestically in determining how much of the program SDIO could implement.

Eventually, after the U.S. and Soviet Union entered into negotiations to eliminate intermediate range missiles in 1986, it became undesirable to fully implement the program. For these reasons and also because of the immense defense spending and large budget deficits over the previous five years, Congress was unwilling to dedicate the same level of funding as in the past.

Funding for the SDI reached its height in 1989 at more than $3 billion, but less than 1 percent went to construction on average. The division's BMD budget reached its peak in 1986 and was afterward never more than 10 percent of the overall budget.

In the end, the changing geopolitical situation made the SDI unnecessary. In 1985, the new secretary general of the Soviet Communist Party – Mikhail Gorbachev – responded favorably to peace overtures by Reagan.

While negotiating elimination of nuclear weapons, Gorbachev introduced reforms – perestroika (restructuring) and glasnost (openness) – to alleviate Soviet financial issues and popular protests.

His unilateral withdrawal of Soviet troops from Eastern

Europe in early 1989 led to Hungary dismantling a border fence in June, Poland holding its first free elections since World War II in August, East Germany opening up the Berlin Wall in October, Czechoslovakia holding free elections in November, and Romania ousting long-time dictator Nicolai Ceausescu in December. The Cold War was for all practical purposes over.

Then in 1991, Lithuania, Latvia, and Estonia voted for independence from the Soviet Union, which collapsed when Russian President Boris Yeltsin took control after Gorbachev's removal. Congress greatly decreased defense spending over the next decade. [6]

Entering office in 1989, President George H.W. Bush initially maintained the SDI and even introduced new elements, such as Brilliant Pebbles, a series of low-cost, space-based interceptors to eliminate ICBMs during the boost phase.

Eventually, however, the changing world situation led to a change in policy.

In his 1991 state-of-the-union address, Bush announced he "directed that the SDI program be refocused on providing protection from limited ballistic missile strikes – whatever their source."

The Missile Defense Act of 1991 (PL 102-190) approved deployment of 100 missiles at one site while keeping space-based elements in a research and development phase. The resulting program, Global Protection Against Limited Strikes, included two subprograms. The Theater Missile Defense (TMD) program protected theater-level assets against missile strikes, but the division did not become involved in it until after 1992.

The National Missile Defense (NMD) program adapted SDI technology to protect the U.S. against limited missile strikes. Although there was no longer a major threat from the Soviet Union, proliferation of nuclear materials and development of nuclear weapons by so-called rogue nations such as North Korea and Pakistan continued to make a BMD system desirable. The NMD program continued in two phases – testing and deployment.

The goal was to deploy antiballistic missiles in the U.S., but the program remained in the experimental phase. Thus, all SDI components, including HEDI and ERIS sites, the ground-based radar, and ground-based surveillance and tracking systems transferred to NMD, along with test facilities at Meck Island, Kwajalein Atoll, and White Sands.

In 1992, HQUSACE named the Huntsville Division the lifecycle project manager of the NMD program. Based on the systems engineering concept, lifecycle project management was a Corps program in which a single agency managed a program from origin to maintenance.

The division had adopted the concept in late 1990 under oversight of a new deputy engineer. The newly renamed SSDC estimated facility work for the program would reach $2.3 billion.

Col. Robert S. Lindsay
February 1987 - July 1987

Col. Charles T. Myers III
July 1987 - April 1990

As before, the division's primary mission was to contract studies, planning, criteria development, and design and construction of test facilities. The SSDC planned spending $120 million on test facilities for 1993. This included designs to refurbish and update the Stanley Mickelson SAFEGUARD Complex in North Dakota, which it had started to bring back online in 1990.

The SALT treaty allowed a single site, and although the U.S. had not maintained it believing BMD ineffective and destabilizing, it remained the easiest site to deploy a BMD in protection of ICBM silos. [7]

While funding for the SDI and NMD remained low, the programs themselves led to many other Huntsville Division space or missile projects.

For a short time, the division maintained a relationship with the U.S. Air Force Space Command, headquartered at Colorado Springs, Colorado. At first, the division supported the command under the Power Reliability Enhancement Program (PREP), through which the division helped to develop power plans for many sensitive facilities.

The largest project involved a generator replacement project at Cape Cod Air Force Station, Massachusetts, through 1988. With the division's SDI work and familiarity with NASA, Division Commander Col. John Poteat recognized an opportunity to expand support of the Space Command. With approval of the Chief of Engineers, Poteat's successor, Col. Rudolph Abbott, signed a memorandum of agreement with the command August 12, 1985, and installed a liaison office.

"Space Command … stated an interest in establishing regular dialogue with USACE on space-related requirements," Colonel Abbott wrote Chief of Engineers Lt. Gen. E.R. Heiberg III in 1985, and especially "a coordinated effort to provide land and space based facilities."

However, there were very few requests outside of PREP work, and most of these the division was unable to fulfill due to its lack of familiarity with aerospace technology. As a result, the division withdrew the liaison in 1987.

"We may have learned a lesson not to be over-committed," Deputy Commander Col. William A. Miller later stated.

The division did, however, assist other SDI agencies with hardening, EMP/TEMPEST, and PREP, including the SSDC, NASA, the Defense Nuclear Agency, and MICOM. PREP itself came to an end soon afterward.

In 1988, the Assistant Secretary of Defense reduced PREP to include only the 10 most critical sites and completion of a design and maintenance manual to guide other sites in completion of reliable power system, but the division was still waiting on funding to finish the manuals at the end of 1992. [8]

After 1988, the Huntsville Division supported the first major projects for NASA since the space shuttle program.

In January 1989, Chief of Engineers Lt. Gen. Henry Hatch tasked the division and the Mobile District to support NASA with design and construction of an advanced solid rocket motor test facility consisting of 48 buildings in Yellow Creek, Mississippi, near Iuka.

The division signed a memorandum of agreement in May with the Marshall Space Flight Center (MSFC) and Mobile District in which the division would review designs and the district would manage construction.

"The cooperation, which resulted in the success of previous NASA programs … will continue through this new phase in our relationship," said Division Deputy Commander Col. Jack K. Norris.

After the 1986 Space Shuttle Challenger disaster, NASA had begun a billion-dollar effort to replace liquid fuel boosters with a new advanced solid fuel rocket motor, which was safer, more efficient, and could support a larger payload. The site selected to develop this system was formerly a Tennessee Valley Authority nuclear facility, which the MSFC sought to refurbish and expand and which the Michoud Assembly Facility in Louisiana would logistically support.

HQUSACE afterward named the division the lifecycle project manager for MSFC with responsibilities to coordinate funding and review all contracts.

After the division assisted with reviewing the prime contract with Lockheed Martin, which broke ground in 1990, NASA scaled back division support to technical review and design coordination, resulting in a new memorandum of agreement in 1991. The division assigned a liaison and project manager at Yellow Creek, and construction began thereafter.

Although facilities funding topped out at $305 million, total division funding was $3.5 million.

By the end of 1992, the design was 98 percent complete and construction was 50 percent complete. The major challenges in the program were poor communications among contractors, untimely submission of designs that held up construction, and "inadequate" cost estimates and safety designs. These delays resulted in schedule slippages and dramatic cost increases, which drew severe criticism from the General Accounting Office (GAO) and Congress.

The situation improved tremendously after the MSFC made the division the design coordinator. However, division involvement ended once construction was complete, and the division had closed out all contracts by 1994. [9]

The division also started support of MICOM with research on the disposal of rocket motors. Prior to 1970, most nations disposed of rocket motors through open burn, detonation, or washing out propellants, but these were no longer considered environmentally friendly, and the costs of compliance with state law was burdensome. There remained huge stockpiles of Honest John, Nike-Ajax, and Nike-Hercules missiles awaiting destruction.

Thus, MICOM began a tri-services effort to research and develop a laboratory-scale method of chemical removal of propellants from rocket motors.

Since the division, which had been supporting MICOM with PREP and hardening projects since the mid-1980s, also had extensive experience with demilitarization of rocket-based chemical weapons, it was already familiar with the technologies and processes involved.

For this reason, MICOM selected the division to award, manage, and provide technical oversight of contracts to investigate disposal processes. Funding rapidly increased from less than $1 million in 1991 to $6.7 million by 1992, with an additional $6 million projected over the next two years. The division awarded the research contract to Hercules Aerospace Company in September 1992. The same year, the U.S. Army Defense Ammunition Center and School also selected the division to investigate the feasibility of marketing reclaimed propellants to other defense industries. [10]

Defense Environmental Restoration Program

Huntsville Division environmental mitigation efforts under the Defense Environmental Restoration Program (DERP) had continued to grow until it was one of the largest division programs. Within DERP, the Formerly Used Defense Sites (FUDS) Program had continued to expand as the division identified more sites requiring remediation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

By 1992, the division had inventoried more than 7,500 sites identified by current owners, the Department of Defense, or other federal, state, and local agencies.

In 1992, the division launched a national FUDS database that would eventually replace the inventory. With a surge of funding, which reached $16 million by 1991, completion of preliminary assessments increased to 500 annually, or more than 4,500 by 1992.

The division planned to complete all preliminary assessments by 1995. The focus would then turn to remediation, most of which local districts managed.

To assist them and to provide quality control, in 1991 HQUSACE designated the Omaha District as the Hazardous, Toxic, and Radioactive Waste (HTRW) Mandatory Center of Expertise. A growing emphasis in FUDS was removal of ordnance, which was evolving into a separate program.

By 1990, the division had gained significant ordnance removal experience at the Hawthorne Army Ammunition Plant, Nevada; the Milan Army Ammunition Plant, Tennessee; the Katama Firing Range, Massachusetts; and other locations.

In a memorandum dated April 5, 1990, HQUSACE named the division the Mandatory Center of Expertise and Design Center for Ordnance and Explosive Waste, which meant that districts had to consult with the division on ordnance removal projects.

Over the next several months, the division became involved in several high-profile ordnance removal projects. These included a $4 million contract to remove ordnance from the Tierrasanta suburb of San Diego, California, formerly part of Camp Elliot.

The Army became aware of the site after an unexploded round killed two children in 1983, and cleanup of the site became a top priority after the establishment of FUDS.

From 1990 to 1995, division contractors removed 22,000 pounds of ordnance debris and 113 live rounds. It was one of the first sites where ground-penetrating radar played a major role. In another project at Raritan Arsenal, New Jersey, division contractors removed 22,000 projectiles, one of the largest ordnance sites.

Altogether, the division had issued $71 million in architect-engineer contracts for ordnance removal by 1991. [11]

The other major subprogram of DERP was the Installation Restoration Program (IRP). The largest customer for IRP work was the Defense Logistics Agency (DLA), with whom the division had signed a memorandum of understanding in 1985 to serve as its design agent.

At peak support of the DLA, the division worked on 50 projects for the Defense Reutilization and Marketing Service to prepare temporary hazardous material storage sites.

In 1987, the Department of Defense Inspector General criticized the number of projects and their cost, which was due primarily to long delays in obtaining permits from the Environmental Protection Agency (EPA) under the Resources Conservation and Recovery Act (RCRA). The DLA suspended work on additional projects in 1988 and 1989 while the division revised a standard design to increase construction savings and speed permitting.

By 1991, with implementation of the new designs, funding for the projects increased to $9 million, and by 1992 the EPA had approved six sites for remediation. Other work performed for the DLA included serving as the single point of contact for groundwater assessments at Defense Fuel Supply Points and managing recycling of chlorofluorocarbons, a pollutant used in refrigeration.

The other major customer under IRP was the Army Materiel Command (AMC), with whom HQUSACE had signed a memorandum of agreement in 1987. At first, the division mostly helped the AMC with permitting, such as open pit burning permits or permits for explosive waste incinerators.

By 1990, however, work shifted to assisting with remedial actions and studies of low-level radioactive and chemical waste removal, including at the Tooele Army Depot, Utah. The budget for these projects increased to $20 million in 1991. As with previous ongoing environmental projects, the division began to decentralize these in 1992, transferring most AMC projects to local districts, although it still managed some Army IRP projects long after this.

In 1990, the division had also started to support the Department of Energy under the IRP in coordination with the Walla Walla District to clean up leaking nuclear material at the Hanford Federal Facility near Richland, Washington, on the Columbia River.

A former Manhattan Project site, Hanford was a Department of Energy site for 40 years, where 177 underground tanks stored 53 million gallons of radioactive and chemical waste, which was contaminating groundwater over 80 square miles. The cleanup would take more than 30 years, an 11,000-person workforce, and $1.5 billion in funding as of 2005. [12]

A major contributor to growth of DERP was Base Realignment and Closure (BRAC), the process used by the Department of Defense to close bases. The drawdown and end of the Cold War after 1988 had led to efforts to reduce military spending and downsize military presence in traditional Cold War theaters.

On May 3, 1988, Secretary of Defense Frank Carlucci established a BRAC commission to make recommendations on base closures independent of Congress based on military need and factors other than regional economy and political patronage.

Congress approved its recommendations in the Base Closure and Realignment Act of 1988 (PL 100-526), which established the precedent of approving or disapproving the entire list as opposed to individual bases. This all-or-nothing approach became a hallmark of later rounds of BRAC. As a result of the BRAC process, the Department of Defense closed 86 bases and realigned or reorganized 59 others through 1990.

The Base Closure and Realignment Act of 1990 (PL 101-510) established an ongoing commission through 1995 working under the same principles as the first BRAC commission – decisions were based on Department of Defense input, and Congress had to approve or disapprove them en toto. The commission met in 1991, 1993, and 1995.

Later BRAC acts extended this process over the next decade. There was, at first, concern BRAC would mean elimination of some Corps of Engineers organizations.

However, after the Department of Defense announced a hiring freeze in 1990, Division Commander Col. Phillip Hall argued at a town hall meeting the division would fare better than most due to being reimbursable and that BRAC was an "opportunity to excel."

In 1990, Congress directed the Corps in the Energy and Water Resources Development Appropriations Act of 1991 (PL 101-514) to develop a reorganization plan, and the Corps submitted a report by Fred H. Baley III in early 1991.

The Corps initially tried to include a plan to eliminate three divisions and 14 districts as part of BRAC, but after Congress blocked this move in the Energy and Water Resources Development Appropriations Act of 1992, Secretary of Defense Richard Cheney announced the Corps would not be included in the BRAC process. Chief of Engineers Lt. Gen. Henry Hatch announced there would be a separate process to reorganize the Corps. [13]

While BRAC did not immediately impact the Corps or the Huntsville Division, it did create new requirements for environmental restoration since by law the government had to list all hazardous substances ever stored on a site and remedial actions taken before transfer of real property.

Starting in 1990, the Office of the Deputy Assistant Secretary of Defense for Environmental Affairs requested Huntsville Division support with BRAC at a level of $3 million per year.

The division had supported the deputy assistant secretary since 1984 with preparing a DERP Annual Report to Congress and maintaining and operating a DERP Information System.

The BRAC work involved ensuring completion of site investigations and environmental assessments at all inactive sites as required by the 1970 National Environmental Policy Act. Most of this work was related to ordnance removal, for which the Ordnance and Explosives Waste Mandatory Center of Expertise served as the primary technical consultant.

In addition, HQUSACE tasked the division in 1992 to prepare assessments of six Army ammunition plants being placed in a standby status for the AMC, with whom it coordinated and oversaw funding. Thus, BRAC created a considerable amount of new work for the division. Between these activities and DERP, the Environmental Program Division in the Programs and Project Management Directorate finally reached 100-percent staffing in 1992. [14]

In addition to this work, the Huntsville Division supported several other environmental programs. While the division initiated no new work for the Army Pollution Abatement Program, it did continue to support pollution monitoring authorized by RCRA, primarily for the DLA.

Col. Phillip L. Hall
April 1990 - June 1992

The division became involved in two other environmental missions in 1990.

One was support of a classified Space Thermal Propulsion Program for the U.S. Air Force managed by Sandia National Laboratories, New Mexico. The division's role was to develop a subscale system to treat and render environmentally safe a high-temperature gas effluent, which the facility design contractor would incorporate into program buildings at Kirtland Air Force Base, New Mexico. Funded at $2.5 million, the district issued a letter contract May 17, 1991, to design the effluent treatment system and an architect-engineer contract March 20, 1992.

However, the program was on-hold at the end of 1992 pending a decision about the future of the program.

In 1990, the division also began to support the Partners for Environmental Progress program, which identified opportunities for privatization of water supply, wastewater treatment, and use of waste as an alternative energy source. The plan involved a partnership among the Corps, local government, and federal agencies such as the EPA to assist military installations with waste treatment and use.

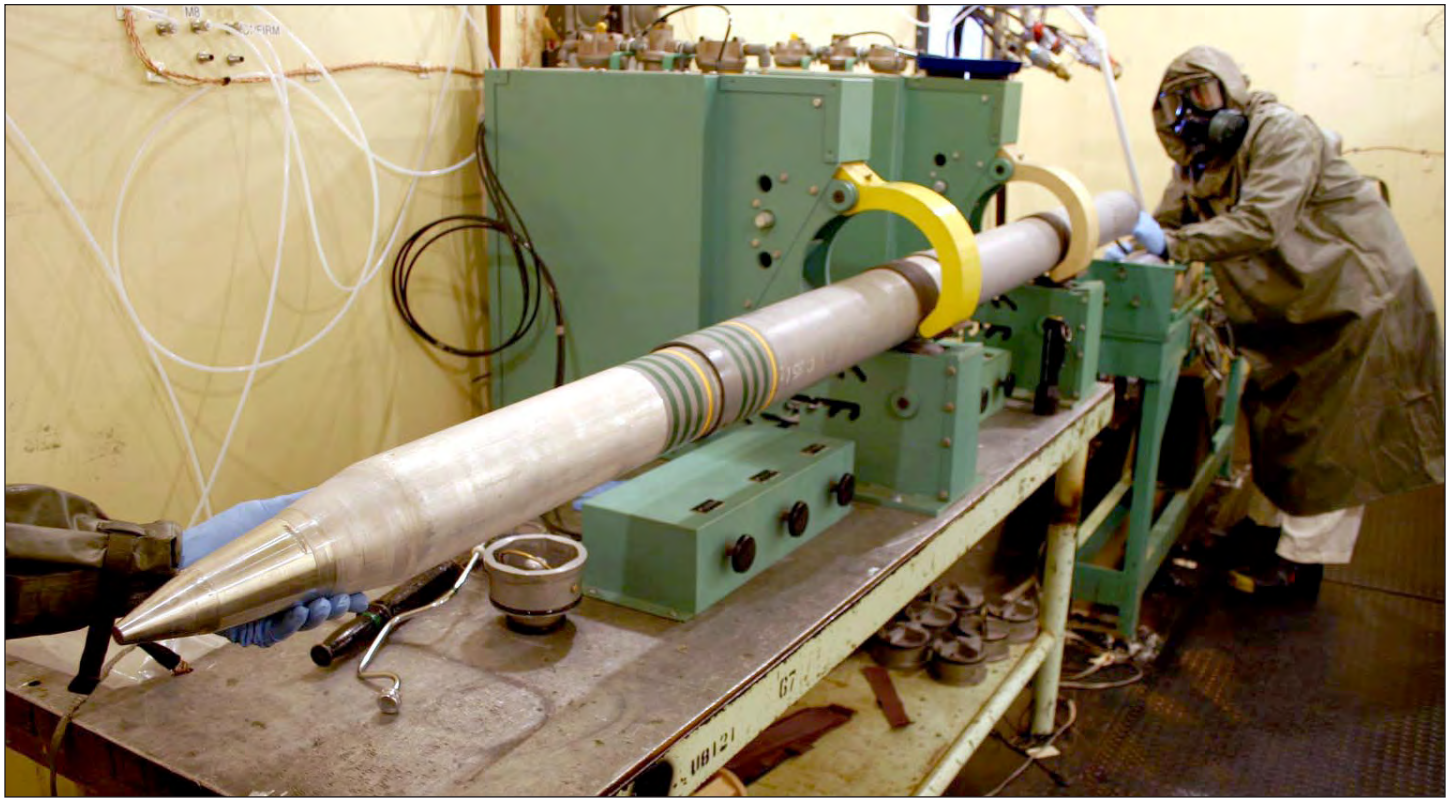
Although the division completed market feasibility studies in 1991 and 1992, as well as building a wastewater treatment plant on Redstone Arsenal as a pilot project, the Army did not pursue active participation in the program, and the division transferred management back to HQUSACE in October 1992. [15]

Progress in Chemical Demilitarization

After 1988, the Huntsville Division made significant progress in the Chemical Stockpile Disposal Program (CSDP). The Pine Bluff, Arkansas, BZ disposal facility had begun operations in 1988, completed all destruction by 1990, and was decommissioned. However, this was in addition to stockpiles of VX or Sarin nerve gas, blister agents, or mustard gas at eight U.S. locations, including at Pine Bluff.

The prototype Chemical Agent Munitions Disposal System (CAMDS) at Tooele, Utah, continued operation at low levels, which the division supported through continued procurement. Construction of the Johnston Atoll Chemical Agent Disposal System (JACADS) was complete, and the plant started operational verification and testing in April 1990.

It went "hot" and started destroying chemical weapons, but at a slower rate to test out all systems. Such testing continued until 1992. This was a truly innovative process, with automated



A technician initiates the process of disassemblying and destroying chemical weapon munitions. (U.S. Army photo)

operations and extreme safety features.

"We prototyped everything on Johnston Island and went through the environmental impact statement and processes," Engineering Director Boyce Ross said.

In July 1990, the Department of the Army announced its intention to store and destroy chemical weapons stockpiles from Germany, as well as Asia, at JACADS.

Meanwhile, construction of the new Tooele Chemical Demilitarization Facility (TOCDF) became bogged down with extremely high cost overruns. Unlike at JACADS, which the division built using a series of fixed-cost contracts, for TOCDF the division had awarded a single cost-reimbursable contract from construction to closure in order to get the project moving quickly. Since the designs were not complete when construction began, the division had to make many modifications to the contract once the design turned out to be more complex than anticipated.

As a result, construction was only 77 percent complete as of 1992. Work also started in 1989 on the Central Demilitarization Training Facility at Aberdeen Proving Ground, Maryland, which would train all workers to operate the plants.

In 1991, the Army confirmed its decision to begin work on the plant at Anniston Army Depot, Alabama, and the contractor began site preparation. Design of the other six facilities had begun and was complete for the Pine Bluff, Arkansas; Umatilla, Oregon; and Pueblo, Colorado, sites by 1993.

As the program began to grow, in 1990 HQUSACE assigned the division as the lifecycle project manager for CSDP and in 1992 assigned the division as the construction agent of the program instead of the South Atlantic Division. The Huntsville Division established a CSDP Directorate separate from other environmental engineering, and despite hiring freezes put in place after the Cold War, it established seven resident offices with 281 personnel. [16]

In addition to helping manage construction of the CSDP plants, the Huntsville Division also assisted with research into alternative destruction methods. Disassembly and incineration had been the official method since the National Research Council (NRC) had recommended it in 1982, but many in Congress questioned the safety of the method.

One method considered was cryofracture and incineration, in which extreme cold nitrogen baths (-320 degrees) would render the chemical agent inert and allow crushing the weapon into small pieces, followed by incineration.

Congress had funded a demonstration plant in 1988 but then put the project on hold until the program manager for chemical demilitarization directed the division to proceed in December 1989.

In 1990, the division awarded a contract to General Atomics for $16.3 million to develop and prototype the concept. In 1991, the Army exercised a contract option to start design of a demonstration plant, and the division managed the contract until the program ended in 1992 after the Army decided not to proceed with construction. The division turned in the final design in 1995.

In the National Defense Authorization Act of 1993 (PL 102-

484), Congress once again requested an evaluation of alternative destruction technologies by the NRC.

Submitted in 1993, the report examined traditional disposal methods such as incineration, chemical neutralization, and relocation, as well as more recently developed methods such as super critical water oxidation, steam gasification, and plasma arc pyrolysis. It found that, while several of these methods had hope of providing safer chemical demilitarization in the future, they would all require additional processes or treatment to make the weapons safe, which would require additional time and investment. As such, incineration remained for the time the most cost-effective solution. [17]

In the meantime, the cost of CSDP had increased greatly, which both the GAO and Congress had criticized. Estimates of the total cost of the program grew from $3.4 billion in 1988 to $7.9 billion in 1992, although only a fraction of this amount was for design and construction of the facilities. Some of the problems were inflationary.

Labor and material costs had increased over time, and continued delays in the program increased the costs.

The original deadline of completing all demilitarization by 1992 had slipped to 1997, 2000, and finally 2004 in the National Defense Authorization Act of 1993. Establishment of these deadlines itself was a cause of some cost increases because it created a truncated development process in which construction started before designs were complete and all processes tested. There were also cost increases related to state opposition to demilitarization, which most often revealed itself through added environmental scrutiny.

It was not a coincidence that the two plants where environmental concerns were minimal – Johnston Atoll and Anniston – were the plants that proceeded the most rapidly.

Changes in the program had also increased the cost, whether through requirements to reexamine alternatives or through the addition of new material.

The National Defense Authorization Act of 1993, for example, added a requirement for the Army to develop a program to dispose of non-stockpile chemicals and facilities, including additional material at production sites. Yet there were also issues with the plants themselves. It took longer to systemize destruction of the weapons than expected, and the JACADS plant had several long delays in operations due to maintenance issues and problems with equipment.

During the first year of operations, there had been six months of delays (900 hours) to resolve issues with a conveyor belt and gates jamming under high heat, furnace flange bolts failing, and pollution abatement systems becoming plugged. Although such issues were routine during preliminary testing of any manufacturing process, safety and political sensitivity made such delays more problematic.

As a result, it was taking longer to dispose of the weapons. During initial peak operations at JACADS, workers were able to destroy only 13 rockets per hour, versus the planned rate of 24 per hour. Even with correction of many of the equipment issues, the destruction rate increased only slightly to 17 rockets per hour in 1992. It was simply going to take longer than estimated to safely destroy the rockets. [18]

As the Cold War wound to a close, the Huntsville Division also became involved in assisting Russia with its chemical weapon demilitarization program. As of 1987, Russia had a 40,000-ton chemical weapon arsenal and 20 dual-use chemical weapons and commercial-use chemical plants, according to its own declarations, although many in the West doubted this number and believed more production was ongoing.

Like in the U.S., the Soviet Union had started efforts in the 1970s to destroy aging chemical weapons from World War II, which were starting to leak and cause safety concerns. Also like the U.S., it had decided early on that it was too unsafe to move chemical weapons due primarily to its inadequate road and rail network. It briefly experimented with a mobile disposal facility and in 1986 built a chemical weapon disposal plant at Chapyavesk using neutralization and incineration processes.

Unfortunately, it closed this plant in 1989 due to local protests and opposition made possible by the new Soviet doctrine of glasnost.

At the same time, the Soviet Union had entered into negotiations with the U.S. on a chemical weapons convention in 1987, not long after it had started nuclear weapon negotiations. Even as the Warsaw Pact nations began to democratize and lift travel restrictions in 1989, U.S. Secretary of State James Baker and Soviet Foreign Minister Eduard Shevardnadze signed a memorandum of understanding September 29, 1989, agreeing to exchange data on chemical demilitarization.

The following year, on June 1, 1990, President Bush and Secretary General Gorbachev signed the Bilateral Destruction Agreement, which required an end to production of all chemical weapons, destruction of all chemical weapons by 1999, and a verification process.

The Soviet Union only implemented this treaty in part because of the implosion of the Soviet Union and the removal of Gorbachev in 1991, although both the U.S. and Russia remained dedicated to destruction of the weapons. Both the U.S. and Russia would later sign and ratify the Chemical Weapons Convention by 1997. [19]

Concern about proliferation of chemical weapons remained high, however, since many of the former Soviet chemical weapons factories were located in independent nations with whom the U.S. had no treaty.

In the Soviet Nuclear Threat Reduction Program of 1991 (PL 102-228), Congress created the Cooperative Threat Reduction or Nunn-Lugar Program, named after Senators Sam Nunn of Georgia and Richard Lugar of Indiana. This program provided

funding for the U.S. to assist former Soviet nations with preventing proliferation, and the Defense Department initiated the program the same year.

In July 1992, the U.S. and Russia signed an agreement in which the U.S. would assist Russia with chemical weapons disposal research. For this purpose, Congress authorized in the National Defense Authorization Act of 1993 using $25 million or roughly 10 percent of Cooperative Threat Reduction funding on chemical weapon disposal.

Given the Huntsville Division's expertise in this area, it is no surprise that HQUSACE named it as the Corps of Engineers agent in executing the program. The division's primary task at first was developing a concept plan for a plant in cooperation with the Russians. Because the Soviets welded their chemical weapons shut to prevent leaking, a process involving disassembly was not possible, which meant that the plant would have to use a drill and transfer system similar to those used prior to the CSDP.

The program began in late 1992, when Kevin Flamm of the Army Chemical Disposal Agency made an unsuccessful site visit to Russia. The trip proved unproductive because of Russian refusal to turn over their plan until approved by local authorities. The issue was representative of the cultural challenges that plagued the project over the next decade, and Russian views of schedules often delayed implementation. [20]

One result of negotiations with the Soviet Union over destruction of chemical weapons was a Huntsville Division project to build a binary chemical weapons assembly plant. The U.S. had not had an operational chemical weapons facility since 1969, but when Russia initially resisted closing its own operations, Undersecretary of the Army James R. Ambrose initiated a project to build a plant for assembling binary nerve gas munitions, in which components of a chemical agent mixed in the air before or during impact of a weapon.

The Army brought in the division to oversee design and construction since it already had experience both with munitions production and chemical weapons. Over several months, division personnel briefed Ambrose several times. After selecting a site at Pine Bluff adjacent to the CSDP facility, the division had proceeded to construction before the Reagan administration pulled the plug.

"Once we started constructing the facilities, Russian diplomats agreed that Russia would discontinue the production of nerve gas if we would stop construction of our facilities," explained John Matthews, who later became director of programs and technical management. "Afterward I realized that the purpose of the U.S. constructing nerve gas production facilities was not to produce nerve gas, but to get Russia to stop making nerve gas."

The final cost of $90 million was a small price to pay, he observed. [21]

Modernization Projects Wind Down

Although the Munitions Production Base Support Construction Program remained one of the Huntsville Division's larger programs, it nevertheless saw considerable decline from the previous decade. This was largely a result of the end of the Cold War and the BRAC process.

Funding declined from more than $300 million in 1987 to $104 million in 1989, which paid for a mere 14 projects. As a result, in 1990, the Army reorganized the program as the Production Base Support Construction Program (PBSCP), and the Production Base Modernization Activity office at Picatinny Arsenal, New Jersey, reduced its workforce from 138 to 62 personnel.

The GAO had criticized the Army for its inventory overrunning need and for the huge increases in contracted Army ammunition plant (AAP) operations and foreign outsourced ammunition.

With the Cold War over, the Army did not need the same amount of ammunition and continually sought to reduce the cost of munitions production by reducing the number of government-operated facilities. Because of BRAC reductions, there were only eight active AAPs by 1992; the rest were placed in a "care-taker" status, in which operators packed them up with the expectation they could return to production quickly if needed. Many of these were contractor-operated. Thus, while operation and maintenance budgets increased slightly, construction budgets declined from $67 million in 1990 to $44 million in 1991.

With fewer construction funds, the division emphasized using up all funds to make up for this decline. In addition, such declines were deceptively inconsistent since some projects were carried from year to year and Congress often later added funds in supplemental budgets – it added $53 million in so-called "plus-ups" in 1991 alone. The division anticipated continued funding for the program, although much of it went to local districts to execute contracts.

In 1992, there were 59 projects worth $179 million under construction at 12 AAPs and 99 projects worth $348 million in design at 13 AAPs, all executed by local districts. [22]

Most of the division's PBSCP work involved new projects that required additional attention. For example, the division remained deeply involved in facilities for the development of RDX and HMX, high explosives used in larger shells and explosives. Work had continued on development of four new RDX/HMX plants in Louisiana, Indiana, Illinois, and Iowa. The contractors completed the initial designs in 1992, and the division completed its design reviews and made corrections by the end of the year. However, the Army chose not to proceed with construction at that time. HMX production at Longhorn AAP, Texas, using the MUSALL process had continued, but the program ended in 1990 after funding cuts.

The division also became briefly involved in two other new production lines. It supported modernization of single base

propellant production. This was a propellant used by cannons and small arms. At the time, Radford AAP, Virginia, was the only plant producing single base propellant. The division contracted preparation of two designs after 1987, but the Army did not fund construction on completion of the designs in 1990.

In 1989, design started on a nitrocellulose plant at Radford AAP. Nitrocellulose is a primary component in many munitions. The two existing plants that produced it were obsolete, and the Army initiated plans to renovate them, starting at Radford. Work on the Radford design started in 1989, but the Army canceled the contract in 1991 after considerable work. [23]

While the PBSCP program was winding down, the Range Modernization Program started to grow. Since 1981, the Huntsville Division had been the Center of Expertise for the Army Range and Training Lands Program and became the Mandatory Center in 1987, which HQUSACE reconfirmed in 1990.

This had been a successful program since 1981 to develop and implement standard and modern range designs. Although funding initially limited implementation of the center of expertise, by 1990 the division had 28 active projects to update ranges. This included design and construction reviews, engineering support, and development of standard design manuals. The largest program for the center was modernization of U.S. Marine Corps ranges. The division had completed its first Marine range in 1989 at Camp Pendleton Marine Base, California.

"The unusual thing about this one is that we did the design in-house," said project manager Phil Loftis. Based on this design, the division entered into a memorandum of understanding with the Naval Facilities Command and the Marine Corps in May 1990 to update all Marine ranges, starting with design projects due in 1994.

In addition, the division completed a training simulator to help train Corps districts with designing ranges, and it served as the fielding agent for the Range Facility Management Support System software for both Army and Marine ranges. [24]

The division continued to support several design standardization efforts for the Corps. The Army Facilities Component System, which the division had supported since 1977, provided standardized designs for contingency operations. The major accomplishment of the division was completion of digitization of all design drawings to AutoCAD files in 1990.

The system faced its first major trial during the Gulf War in 1990 and 1991, and the division captured numerous lessons-learned and initiated a number of changes in 1992 as a result. Meanwhile, the criteria documents update program, including the guide specifications and technical manual updates, faced serious funding constraints in 1989 that nearly ended the program.

A process action team from HQUSACE investigated the lag in completing updates and recommended moving the program back to HQUSACE in 1992.

Instead, HQUSACE recommended making management improvements, including spending all funds received each year.

By 1992, this amounted to $5 million annually to make 100 actions each year. The division continued to support the standardization of designs for child development centers, play areas, hazardous material storage, fire stations, physical fitness centers, and aviation maintenance facilities. Funding continued at roughly $350,000 annually. As part of these updates, the division also continued to update the mobilization or "M" documents.

The division completed the first three phases of these updates amounting to 148 facility types by the end of 1989, for which it received $12 million in funding. However, like other mobilization tasks, the necessity of the program became less urgent after 1989, and the Army ended the program in 1990 before completion of phase IV, with the division discontinuing support of it in 1994. [25]

By 1990, the Huntsville Division picked up a new standardization mission supporting operations and maintenance (O&M) guides.

In 1982, HQUSACE had formed a panel to investigate and evaluate Corps construction management. What it found was that the largest tenant complaint was problems with post-construction maintenance. At the time, most non-technical facilities did not require maintenance guides.

As a result of this inquiry, HQUSACE initiated the Operation and Maintenance Engineering Enhancement (OMEE) Program to prepare O&M guides for all facilities. Since the division was already completing designs and guide specifications for many other facilities, HQUSACE subsequently tasked the division to help prepare the guides, naming it as the Technical Center of Expertise for the program February 14, 1990.

Its first task was to update Engineer Regulation 310-3-11 to serve as the charter for the program. The center's purpose was to ensure that, when a facility became operational, it had all necessary O&M documentation, training, and repair parts. Although funding slowed implementation of the center, the division was able to launch a pilot project to develop an O&M guide for a hospital in Wurzburg, Germany – most early projects were related to healthcare facilities, where the division already had resident expertise.

Through 1992, the division followed this project with ones at Nellis Medical Facility, Nevada; Brooke Army Medical Center at Fort Sam Houston, Texas; Medical Facility Replacement at Homestead Air Force Base, Florida; Reynolds Army Hospital at Fort Sill, Oklahoma; Incirlik Air Base Hospital, Turkey; and Rhein Main Air Base Clinic, Germany. [26]

High-Tech Support

While the Huntsville Division's work on larger environmental, chemical demilitarization, and modernization programs continued, its reputation for providing advanced technical support remained strong.

The division had continued to provide high-tech procurement for the Office of the Surgeon General by obtaining furnishings and equipment for medical facilities at multiple bases. It supported major procurement projects for the Madigan Army Medical Center, Washington, and at Incirlik Air Base, Turkey, totaling $5 million. It completed these projects in 1990 and 1991. It added several new advanced equipment procurements.

In 1989, the division awarded a contract to provide magnetic resonance imaging (MRI) machines, which provided highly sophisticated medical images without using harmful X-rays. The contractor provided MRI machines at 14 sites through 1992 for $43 million, starting with Fitzsimons Army Medical Center, Colorado.

In 1990, the division added contracts for Medical Diagnostic Imaging Support Systems. This was a filmless imaging system developed by the Army, Air Force, and Navy surgeons general in January 1990 that used digital images for diagnosis, creating a standardized and highly efficient system. The division estimated the total Department of Defense requirement at more than $30 million. The contractor had supported nine sites by 1992.

Likewise, the division also supported procurement of computed tomography (CT) scan systems, a computer-based system that took multiple X-rays from various angles to produce 3-D images. The division had installed CT scanners in six hospitals by 1992. At the same time, the division also procured furnishings for the Army Reserve at 32 sites for $3 million. A newer procurement mission involved obtaining engineering equipment for the Corps' Engineer Technical Laboratory at Fort Belvoir, Virginia.

One of the division's minor missions since 1977 had been to support the laboratory with contracting various engineering and terrain analysis tasks at a low level of funding. In 1990, the division helped to procure engineering equipment such as bore hole loggers and seismographs using two large indefinite delivery indefinite quantity architect-engineer contracts valued at $520 million. The division issued 11 task orders on the contract through early 1992. [27]

The division remained heavily involved in energy conservation programs. By 1989, the division had completed Energy Engineering Analysis Program baseline evaluations at 200 bases needed to compute energy savings. Afterward, HQUSACE transferred responsibility for the program to field organizations and named the Mobile District as the Technical Center of Expertise.

The Energy Monitoring and Control System Program, now renamed the Utility Monitoring and Control System Program, faced reduced funding and knowledge loss. However, the division continued to provide technical support to installations, with major projects at San Diego Naval Base, California; Fort Belvoir, Virginia; and the Karlsruhe Firm Neutral Data Demonstration in Germany.

The Shared Energy Savings program, which developed contracts that split energy savings between contractors and the government, saw a flurry of interest through 1992. The division issued the first contract in 1988, which was in place by 1990.

As a result of this success, HQUSACE named the division the Technical Center of Expertise for the program. Because of the complexity of the contracting, the division developed a software tool to estimate savings.

Unfortunately, a change in law in 1992 made the contracts less appealing. In the Energy Policy Act of 1992 (PL 102-486), Congress allowed only dedicated and not ancillary savings from energy use. For the same reason, the Third-Party Contracting Program also became less appealing. These were contracts that allowed owner-operators of utilities serving military bases to reap benefits from savings in energy use.

In 1990, Secretary of the Army Michael Stone endorsed the program, and the division started projects at New Cumberland Army Depot, Pennsylvania; Fort Dix, New Jersey; and Redstone Arsenal, Alabama, the latter of which broke ground in 1991.

However, due to changes in law, no contracts were under consideration in 1992. A new contracting program – Demand Side Management – faced a similar fate. This program allowed the government to enter into contracts with utilities to reduce electricity demand through energy-saving equipment and services, which saved owner-operators from having to purchase new plants.

In 1991, HQUSACE named the division the Technical Center of Expertise for the program, but as of 1992, no contracts had been awarded. In another energy-related program, in 1991 the DLA had selected the Huntsville Division to develop operation manuals for pipeline operations. The division had started surveys at 12 Defense Fuel Supply Points by 1992, and it had completed conforming storage facility redesigns. [28]

Assigned as the Mandatory Center of Expertise for Intrusion Detection Systems (IDS), the Huntsville Division was quite busy in the early 1990s providing technical and management support for the delivery of electronic security systems.

In 1987, the division had signed a memorandum of agreement with AMC to provide engineering support for the Integrated Commercial Intrusion Detection System and provided support for installation of the system at five sites starting in 1991.

In 1989, the Intelligence and Security Command requested division help with upgrading its facilities, including security systems, utilities, power reliability, and design. The funding level for this effort was $500,000 annually for several years.

The division assisted with several other large electronic security projects, including providing security at the Tooele Army Depot, the Goodwill Games in 1990, and at the Adelphi Research Center, Maryland, in 1991. The contracting effort at the latter alone reached $15 million.

In the meantime, as center of expertise, the division continued

to support design and troubleshooting of electronic security systems at small levels, for example, working with the Protective Design Center of Expertise at the Omaha District.

In 1990, the division offered the first training course in IDS, which proved highly popular. Yet despite this progress, the program faced perennial underfunding and labor issues, and the center often lacked the resources it needed.

One of the more interesting projects Huntsville Division supported during this era was the development of a MAGLEV, or magnetically levitated train. The technology used magnetic fields to raise vehicles from ground contact, which allowed far greater speeds and lower fuel consumption than with vehicles using wheels slowed by friction.

Although the concept of a MAGLEV had existed since the early 1900s, it was not until 1953 that Hermann Kemper developed a proposal for using electromagnetic suspension (EMS) or attraction and 1966 that James Powell and Gordon Danby developed a proposal for electrodynamic suspension (EDS) or repulsion. EMS involved magnetically pulling the train up to a rail at a controlled distance, and EDS involved magnetically repelling the train above a rail.

After Congress authorized research in the 1965 High Speed Ground Transportation Act (PL 89-220), several research projects proceeded on a MAGLEV, including projects by General Motors, MIT, and Ford Motor Company. Most U.S. research terminated in 1975 because the increased availability of air travel made high-speed ground transportation less appealing, but by 1990 Germany had built a prototype MAGLEV train and Japan had one in advanced planning. Germany's MAGLEV using EMS technology ran 19.5 miles at speeds up to 280 miles per hour.

Japan's proposed 300-mile MAGLEV using EDS technology would carry more than 100,000 people daily at speeds up to 350 miles per hour, according to tests. With renewed interest in alternative high-speed ground transportation after 1988, Congress authorized a study of MAGLEV technology led by Federal Railroad Administration.

In the interim, it approved $1 million in the Energy and Water Development Act of 1990 (PL 100-101) for the Corps of Engineers to research how to implement a MAGLEV in consultation with NASA, the Department of Energy, and the Department of Transportation, with an anticipated long-term cost of $25 million.

The three-phase plan included planning the effort in 1990; gathering data, completing studies, and assessing technology in 1991 and 1992; and implementing a prototype in 1993. HQUSACE tasked the Huntsville Division to head the Corps research program in 1989.

Division work on MAGLEV, although not high-dollar-value, was a high-profile effort. In 1990, to coordinate competing research programs, the Office of Management and Budget created the National MAGLEV Initiative (NMI), which included the Corps, Department of Energy, Department of Transportation, and Federal Railroad Administration, co-chaired by Assistant Secretary of the Army for Civil Works Nancy Dorn and Secretary of Transportation Samuel K. Skinner.

Over the next two years, the division issued 27 technology assessment contracts valued at $4 million and four system design concept contracts valued at $2 million. Total funding for the NMI increased to $36 million by 1993, of which just under half went to the Corps of Engineers. In general, the NMI considered three options: develop an EMS MAGLEV on the German model, modify either the German or Japanese MAGLEV designs (EMS or EDS), or develop a new system.

Complicating this work was the passage of the Intermodal Surface Transportation Efficiency Act of 1991 or ISTEA (PL 102-240), which President Bush signed in December 1991.

This act created a $724 million MAGLEV prototype program intended to replace the NMI, with requirements to establish a project office and award a conceptual design contract within a year.

The act continued a joint chairmanship of the program by Assistant Secretary Dorn and Secretary of Transportation Andrew Card, but Dorn believed the program would only be successful if a single agency led it and recommended the Department of Transportation take a greater role. Although the NMI executive committee disagreed, she also believed that the government was not ready to proceed with a prototype and urged completion of NMI research, which was planned for the following year.

With the concurrence of Congress, the Bush administration established a MAGLEV task force led by the department to begin preliminary planning for the prototype until completion of NMI research, at which time it would establish a joint project office as required by ISTEA. However, the administration did not schedule any funding for 1992 or 1993.

Suddenly, it became unclear what the Corps' and Huntsville Division's future role in the prototype would be, although it still had to complete its research. [31]

By 1992, the Huntsville Division had become the assigned responsible agent for 29 automated systems with 2,000 users worldwide. Since being assigned responsibility for the DD Form 1391 Processor, the division had expanded this application considerably, and it now maintained 28,000 forms with 500 added each year. In 1990, the division added support of five new financial programs, including Navy Military Construction, Shared Energy Savings, and Desert Storm.

By 1992, the division annually trained 150 on its use. The division expanded the ECONPACK software, used for lifecycle cost analysis. It trained 180 personnel on the software in 1990, and completed a personal computer (PC) version in 1991.

In 1988, HQUSACE assigned the division responsibility for

the ENG Form 3086 Processor. The ENG Form 3086 displayed current working estimates for budgeting. The division completed the system to operate on the Programming, Administration, and Execution (PAX) network and fielded a PC version of the software in 1992.

Also in 1988, it became responsible for updating the Army Criteria Tracking System and in 1989 added a PC version. However, the database quickly became out of date, and HQUSACE did not fund the product in 1992. In addition, the division added a software tool, PC-DUGOUT, to help PCs access the PAX network. In 1990, HQUSACE assigned the division responsibility for the Lifecycle Management Automation System, used mostly by the Office of the Chief of the Army Reserve.

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After the division signed a memorandum of agreement with the office in 1990, it developed a PC version of the software by 1991, which it renamed the Engineer Management Automation Army Reserve (EMAAR). The division trained 24 personnel on the system by 1992. By 1992, all of these systems ran on PAX.

Despite loss of several personnel responsible for the Computer-Aided Cost Estimates System (CASES), the division made significant progress in developing the software. It assumed responsibility for a contract to complete a microcomputer version in 1990 – MACES Gold.

In 1991, the Department of Defense adopted it as the tri-services standard, and by 1992 the division had completed a tri-services version (TRACES). However, the largest software project the division supported was fielding of the Corps of Engineers Financial Management System (CEFMS), a complex system used to track all Corps financing and contracting. Assigned to field-test CEFMS in 1991, the division started training on the system in 1992.[32]

The Corps of Engineers training program had continued to grow under Huntsville Division management. By 1992, the Proponent Sponsored Engineer Corps Training (PROSPECT) had included 433 courses and 14,288 students, up from 156 courses and 12,295 students the previous year.

Of these, 66 courses involving 2,678 students occurred in Huntsville; the rest were held at other Corps facilities. The Bevill Center at the University of Alabama in Huntsville (UAH) remained highly popular because being nonprofit kept rates low for the hotel.

However, the facility was inadequate for the level of growth, and the UAH agreed to end its use of the facility for continuing education. The division conducted a major renovation of the facility from February to May 1992 to make room for additional staff. About 22 percent of students – 3,242 – came from other agencies. About 1,473 came to attend the Department of Defense Schools Training Program offered through the division. Others came to attend environmental training, which attracted more than 1,800 students by 1991, an increase of more than 1,000 from the previous year.

In fact, growth of environmental training was so rapid, HQUSACE recognized the division as the Environmental Training Support Center, and the division created an Environmental Training Management Division as a result.

Likewise, many non-Corps agencies purchased Corps of Engineers Nontraditional Systems Training (CONTRAST) courses, which were less expensive than traditional training and available at the work site.

As of 1991, 85 facilitators had trained 732 students in 118 sessions, making it far more economical than traditional training. By 1991, the division had produced 790 minutes of video and 2,100 pages of training guides for CONTRAST.

As with all training it developed, it followed the Corps of Engineers System Approach to Training, a multidisciplinary approach to engineering training. However, at the end of that year, HQUSACE combined PROSPECT and CONTRAST into a single PROSPECT program, although the division continued to support distance learning efforts.

The division also introduced the Leadership Management Internship in 1990. This was internal leadership training that Colonel Hall introduced based on a similar program used at his former command. It was a year-long management training program to raise up leaders among technicians rather than technically training managers. The program included field trips to Iuka, Vicksburg, and Washington, D.C. The first class (1991-1992) included 12 personnel selected from 40 who applied.[33]

Wars and Other Disasters

On August 2, 1990, Iraq invaded Kuwait over an oil dispute, sending the royal family there into flight.

On August 6, Saudi Arabia supported stationing U.S. troops along its border to protect it from Iraqi aggression. By December, half a million U.S. troops deployed to the region as part of Operation DESERT SHIELD.

By October, more than 100 members of the exiled government of Kuwait met in Washington, D.C., to plan rebuilding the small nation. One of the key agencies involved in this planning was the Corps of Engineers, who helped with emergency construction.

In December and January, Corps elements, including

the Huntsville Division, briefed the Kuwaiti government on capabilities including disaster relief and training.

From January 16 to February 27, 1991, the U.S. executed Operation DESERT STORM to liberate Kuwait. The same day military forces rolled into Kuwait City, the Corps established the Kuwait Emergency Recovery Office, which worked to restore utilities, rebuild roads and schools, and remove ordnance using funding from a Military Sales Case.

Over the next 18 months, it would execute more than $200 million in contracts. The Corps divided the U.S. area of operations into multiple regions, with a contractor responsible for work in each of the regions. The work force in the office itself eventually grew to more than 200 personnel, about half of them Kuwaitis or Saudis. Most Corps personnel were volunteers from U.S. districts and divisions; the Huntsville Division among them.

At the height of the operation in the spring of 1991, 16 Huntsville Division civilian and military employees were supporting the recovery effort. This was in addition to a large number of reservists participating in combat operations. The U.S. had undergone a dramatic shift to civilianization of the military force since the Vietnam era, and civilians amounted to roughly 5 percent of the total force. [34]

Two Huntsville Division capabilities played a critical role in the war. The Army Facilities Component System (AFCS), which provided ready-made documentation on facilities for use in desert and other climates, received its first major test.

All three military services heavily used the system, but none more than the 412th and 416th Engineer Battalions. As this was the first major use of AFCS, it became necessary for the division to provide training, technical guidance, and instruction on use of the system to multiple users in Saudi Arabia and Kuwait, as well as in the U.S. The division also helped to collect lessons-learned from users after the war to improve AFCS.

A second division capability that directly supported the war was procurement of medical equipment. Several military hospitals in Europe, as well as field hospitals in Saudi Arabia, requested support in obtaining medical equipment, primarily CT scanners.

Since the division was already in the middle of an extensive procurement for the Office of the Surgeon General, it already had contracting vehicles in place. Over the course of Operations DESERT SHIELD and DESERT STORM, the division provided more than $6 million in equipment.[35]

The Gulf War was not, however, the first emergency that Huntsville Division employees had supported. After Hurricane Hugo ravaged South Carolina September 22, 1989, a number of employees volunteered to help relief efforts.

Many more volunteered for a disaster closer to home – the tornado strike of November 15, 1989. That was the largest tornado to strike the city of Huntsville since 1974.

Touching down at 4:37 p.m., the tornado hit southwest Huntsville before jumping to the heavily populated Airport Road. It destroyed 119 homes and caused $250 million in damages. Many employees lost property, and one was actually at home and survived the destruction.

Although the Nashville District had regional responsibility for response to the disaster at the time, many division employees volunteered to distribute food and water; and the division Public Affairs Office became an active part of the response team by helping to capture and document the relief efforts on film and in written word.

Huntsville Division employees also supported relief efforts after Hurricane Andrew in 1992. Andrew struck Florida just north of Miami, August 24, 1992, leaving a huge path of destruction until it reentered the Gulf of Mexico and hit Louisiana days later.

It was, at the time, the most damaging disaster, and remains the third most damaging at $42 billion in damages. It destroyed 82,000 businesses and 160,000 homes. The Jacksonville District led by Col. Terrence "Rock" Salt established the Hurricane Andrew Recovery Office at the Miami Airport, which became part of a multi-service task force that responded over many months.

Altogether, 10 Huntsville Division employees served in some capacity during the disaster. As with most Corps organizations, many civilians and military personnel volunteered for service throughout the nation during emergencies or special missions. [36]

Even at the time that President Reagan made his Star Wars speech, analysts noted, "It would be difficult to exaggerate the historical significance of the president's generic endorsement of the idea of ballistic missile defense."

It had repercussions that were both political and social in nature. It also had impacts on the history of the Huntsville Division, which saw a dramatic increase in its BMD work and programs. While such work made up only a small part of the division's budget, with considerably more going to DERP and chemical demilitarization, it had a dramatic impact on the national reputation of the division.

Including other work for NASA, MICOM, and even the Department of Transportation, the division became known as a space-age agency, which closely matched the reputation of Huntsville itself, which had long been known as the "Rocket City."

It was because of this reputation that, despite cuts and declines after the Cold War, the division had grown over the previous decade from a strength of less than 400 in 1982 to nearly 575 in 1992, with a growth in funding from $75 million to more than $389 million. Division work had grown to include, not only missile defense, but also environmental programs, chemical demilitarization, installation modernization, energy programs, construction standardization, and a range of technical support programs.

Deputy Chief of Engineers Maj. Gen. Peter Offringa observed this growth at the 25th anniversary celebration of the Huntsville Division October 15, 1992. Asking who the Army turned to for leadership of its most technical programs, he said, "The answer is always the same: Huntsville Division … It has grown: strong and diversified. It was professional, it was capable, it was a national asset." [37]

Since 1989, a major concern of Huntsville Division employees was the result of BRAC. As the Cold War ended, the Department of Defense was greatly downsizing operations, closing bases, and eliminating unnecessary units. Throughout the early 1990s, BRAC was a routine subject of discussion at the division.

As a result, Colonel Hall held numerous town hall meetings at the division in 1991 and 1992. Although the Corps of Engineers was no longer part of the BRAC process after 1991, it was still possible that the Corps could eliminate or relocate the division as part of its own downsizing and reorganization.

By the end of 1992, this seemed unlikely. General Offringa spoke of the division "leading the Corps to greater accomplishments and service to the nation." Despite this, there were many changes in the air. For one thing, the division had outgrown its facilities and was now looking to relocate. The division might gain or lose missions through the reorganization of the Corps. As it turned out, the changes were much more dramatic and yet much more positive than most imagined. [38]

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Engineering and Support Center, Huntsville, 1993-1998

The Huntsville Center at its present location on University Square in Huntsville, Alabama.

On August 9, 1995, Dr. John H. Zirschky, the acting Assistant Secretary of the Army for Civil Works noted that the recently passed Energy and Water Development Appropriation Act would require "either the conversion of Huntsville Division from a MSC [major subordinate command] to an engineering center or other entity, or the elimination of the Huntsville Division."

Since Base Realignment and Closure (BRAC) started in 1988, the possibility had been lingering that the U.S. Army Corps of Engineers would have to eliminate the Huntsville Division as part of a pending reorganization. Now that the reorganization of the Corps was proceeding, the threat of elimination loomed large.

Col. Walter J. Cunningham, the 13th division engineer, held numerous town hall meetings to address employee concerns.

Within weeks, however, Cunningham learned that the Headquarters of the U.S. Army Corps of Engineers (HQUSACE) was not going to eliminate the division as some feared, but instead was going to realign the division as an engineering support center, a unique entity that would support regional districts and divisions with highly technical or national engineering requirements.

This more closely reflected the mission of the Huntsville Division, which, unlike other Corps divisions, had no geographic boundaries or responsibilities and no subordinate districts. The reorganization removed doubts about the division's mission and purpose, positioning it for greater growth. [1]

During the same time, the new Engineering and Support Center, Huntsville, began to greatly improve its business processes to reduce costs and make better use of funding. The division had always been mostly cost-reimbursable and had made many attempts over its history to improve efficiency and reduce overhead.

Programs such as value engineering had greatly reduced design and construction costs, and management improvements had increased efficiency in limited areas. With the adoption of the Army Performance Improvement Criteria in 1995 and with improvements in computer automation and networking, the center was able to make more dramatic increases in productivity.

In the meantime, it continued to advance its core missions of demilitarization, environmental restoration, ordnance removal, forces support, and other advanced technology projects supporting a wide range of military and civilian agencies.

New Building and New Name

The Huntsville Division had grown considerably by 1992 and had more than 600 permanent employees. It had outgrown its facility on Wynn Drive in Cummings Research Park, in west Huntsville, and had employees in offices throughout the city. These included its warehouse on Bradford Drive and its training facility at the University of Alabama in Huntsville (UAH), which the school had vacated to provide more space for division personnel.

Col. Walter J. Cunningham
June 1995 - August 1999

The primary reason for occupying the building on Wynn Drive, which the division shared with the U.S. Space and Strategic Defense Command, was to coordinate on the SAFEGUARD mission, but with the decline of the missile defense program over the years that reason was no longer as strong as it had once been.

Recognizing these challenges, in February 1992, Col. Phillip Hall had organized the Division Urgent Moving Project (DUMP), led by Bob Joslin with representatives from the Resource Management Office, Information Management Office, and the Engineering Directorate. The DUMP committee submitted a request for space to the General Services Administration (GSA) in April 1992 and received several offers by the end of the month.

By June, the GSA had identified four possible sites: buildings once used by the Ballistic Missile Defense Organization, computer manufacturer SCI, and Chrysler Corporation, and an undeveloped site near Madison Square Mall. All would require major renovations or construction.

In a surprise move, the GSA received an offer on a new site by the end of the year. It was an empty car lot near Wynn and University Drives that was much lower cost. The location at 4800 University Square was just a few miles from the division's existing offices and the mall.

The GSA chose the latter as most cost-effective despite the need for new construction. The location and the existing parking lot made the site particularly appealing. [2]

The division helped to design the new building, which would be 123,000 square feet and three stories. The GSA managed construction with the division as the customer.

On September 3, 1993, the GSA issued a lease and a $3.2 million contract to BBCGH Partners One to build the facility by January 1994. After the contractor broke ground on the new facility in October 1993 with representatives from the division present, construction slipped considerably.

As a result, the new building was not available until August 1994, and the division was not able to finish moving in until December, although it had been packed up and ready to move since June.

"Now we're on the 'customer' end of the engineer/building process," Col. Robert D. "Duncan" Brown said. The move was a joint effort of the Information Management and Resource Management offices and directorates of Contracting and Logistics.

Once moved in, the division held a ribbon-cutting ceremony March 28, 1995. For the first time in more than a decade, the majority of employees were finally housed in a single building. [3]

By this time, reorganization of the U.S. Army Corps of Engineers had proceeded. The BRAC process had continued, and the Department of Defense pledged to reduce its workforce by 150,000 by 1997. HQUSACE also had sought to reduce its workforce by 4,200 by 1999, but mostly through attrition.

After Congress had rejected the Fred Baley report in 1991, planning for reorganization had started over in 1992, and HQUSACE had developed a plan supported by Assistant Secretary of the Army for Civil Works Nancy Dorn to reduce ten divisions to six with corresponding reduction of the number of districts.

However, incoming Secretary of Defense Les Aspin rejected this plan because of opposition to eliminating districts. Colonel Brown worked to manage employee expectations by holding frequent town hall meetings.

The 1996 Energy and Water Development Act, which President William J. Clinton signed in 1995, required the Corps to submit a new plan within 60 days. The plan submitted reduced the number of divisions from 10 to eight and realigned all existing districts without elimination.

Dr. John Zirschky noted in an August 1995 memorandum that the Huntsville Division was one of the divisions considered for elimination. When word leaked out to division employees on August 14, the new commander, Colonel Cunningham, met with employees throughout the day stressing it was unlikely that the division would close.

This proved accurate when in October HQUSACE requested input for a new name for the division. On November 3, 1995, Secretary of the Army Togo D. West approved the Corps reorganization plan, including designation of the division as the U.S. Army Engineering and Support Center, Huntsville.

Official orders directing this change came November 22. This new name more closely reflected the activities of the Huntsville Division, which did not really change under the reorganization.

"Division implies a command and control function that we did not have. At this time when the government is concerned about layering and too much overhead, being associated with that overhead was not in our long-term best interest," Colonel

Cunningham said. Redesignation of the division as a center repositioned it for future growth by redefining its mission as a headquarters element. [4]

Most of the organizational changes that occurred by this time were fairly minor and driven more by ongoing mission.

Due to new responsibilities for construction in the chemical demilitarization program, the Center had created a Construction Directorate in 1994, and enlargement of the ordnance removal mission led to the creation of an Ordnance and Explosives Directorate in 1995.

Perhaps the largest change that did occur at this time was the loss of responsibility for the training mission. The training mission had continued to grow and had, by 1995, reached a peak of 13,396 personnel trained in 424 classes, of which 374 were in Huntsville at the Tom Bevill Center at UAH.

The Huntsville Center had expanded the nontraditional program, which was now part of the Proponent Sponsored Engineer Corps Training (PROSPECT), to include 870 video courses, 1,282 facilitator guides, and 15,863 study guides. Forty-three personnel attended the Department of the Army Leadership Education and Development Course.

However, the retirement in 1993 of Emmett N. Creekmore, who had been the training director since 1979, meant the removal of the strongest element of continuity for the center within the Training Directorate. Thus, less than a year after the reorientation of the Huntsville Center, HQUSACE spun off the mission as the U.S. Army Corps of Engineers Professional Development Support Center reporting directly to HQUSACE September 9, 1996.

HQUSACE continued to use the Bevill Center as a tenant of UAH, and the Huntsville Center continued to provide logistical, information management, contracting, and administrative support to the training mission. This ended Huntsville's management of the Corps training mission. [5]

Efficiency Improvements

At the same time that the Huntsville Center was undergoing these changes, it also was working to improve efficiency and reduce any criticism about its cost. Over the years, the center participated in numerous programs to increase efficiency and improve operations.

Since 1970, the division maintained a full-time value engineering position with its own office. The value engineer reviewed designs for redundancy and made recommendations for savings. Although this position became adjunct in addition to other responsibilities in 1988, in 1992 the center reestablished a full-time position reporting directly to the commander.

In 1993, Colonel Brown required the value engineer to review all acquisition plans. The value engineer maintained an average savings ratio of $20 for every $1 invested. The amount saved ranged from $33 million in 1995 to $540,000 in 1996.

Other positions focused on treatment of employees. The Equal Employment Opportunity (EEO) Office worked to maintain equal treatment of men and women of differing races. The Huntsville Center had an aggressive EEO program with numerous events, training, and speakers. There were few EEO complaints filed annually and none at all in 1996.

Although the number of minorities in the center workforce was less than in the civilian labor force overall, the center had a higher than average percentage of women until the transfer of human resources personnel to a new regional Civilian Personnel Assistance Center (CPAC) on Redstone Arsenal.

The Huntsville Center made great strides in training its personnel. After the Leadership Management Intern Program ended in 1995, the center established the Leadership Development Program, a two-year voluntary self-paced program.

In 1996, 34 employees took part; in 1997, 29 employees did. Other programs focused on suggestions. Army Chief of Staff Gen. Carl Vuono established the Army Communities of Excellence Program in 1990 as an Armywide program to improve facilities and morale.

Chief of Engineers Lt. Gen. Henry J. Hatch supported the program, and all Corps organizations competed against other Army units to win recognition. The Huntsville Center, which based actions on unit surveys, won second place Armywide in 1991. It resulted in improvements such as construction of a break area.

In another program, the Army Ideas for Excellence Program, a coordinator evaluated and implemented suggestions from the workforce. The center adoption rate was 5-10 percent higher than the Army average. Among suggestions adopted were use of preprinted shipping labels and digital printing, which saved $31,000 in 1994 alone. It would eventually become part of the Total Quality Management program in 1996. [6]

Total Quality Management (TQM) was a business philosophy embracing customer satisfaction, employee empowerment, and constant measurement. The idea was to allow employees to suggest and make measureable improvements that would result in improved customer service.

After the Army embraced the program to improve Army operations in 1992, Colonel Brown established a TQM implementation committee and TQM coordinator Jim Wilson in 1993. The committee attended training on the program but found that Army Regulation 5-1 provided little guidance on how to implement TQM; every Army unit managed TQM differently. The model adopted by the center was to create an off-the-chart organization.

Employees made suggestions for improvements, which a quality management board would review. It would then assign process action teams to implement the suggestions.

By 1994, there were four teams investigating suggestions related to travel, engineering, contracting, and information

technology. The program resulted in several large improvements.

For example, as a result of a TQM suggestion, the center first established a government travel office, which afterward became an Armywide change. TQM improved several processes through the elimination of paper forms. It also improved contracting by limiting proposals to 130 pages.

As the program grew, the center became an enthusiastic supporter and published a Quality Times newsletter and included a "TQM Corner" feature in issues of the Huntsville Center Bulletin.

In 1997, the center established a Quality Coordinator Office headed initially by Jeff Seward and then later by Diane Hesler and Donna Rovere.

In 1996, the Army moved the Army Ideas for Excellence Program under the TQM umbrella, making future contests about quality. [7]

Col. Harry L. Spear
August 1999 - August 2003

Perhaps the greatest efficiency improvements came with the adoption of the Army Performance Improvement Criteria (APIC), which rolled up improvements made under value engineering, TQM, Army Communities of Excellence, and the Army Ideas for Excellence Program.

The program got its start with business process improvement philosophies such as Lean, which sought to improve customer value using fewer resources and eliminating waste, and Six Sigma, a data-driven improvement process that sought to eliminate product and process defects. As numerous consultants began to offer process improvement services, Secretary of Commerce Malcolm Baldrige established a business improvement program focused on measurement, which Congress enshrined in Public Law 100-107.

Named in honor of Baldrige, who died shortly before passage of the law in 1987, the program established a national business improvement competition in which businesses in three size categories submitted a report documenting process improvements, which the Bureau of Standards would judge. The resulting coveted medal and recognition became a major marketing point for winners.

In 1995, the Army established APIC based on the Baldrige criteria, making it the basis for future Army Communities of Excellence submissions.

In a contest similar to that for the Baldrige Award, Army units submitted a report outlining efforts to measure and improve quality in seven categories: leadership, information, planning, human resources, business results, and customer satisfaction. The Huntsville Center adopted APIC the same year. [8]

The APIC program as implemented in Huntsville was similar to its TQM program, which actually rolled into APIC results.

Colonel Cunningham assigned Rodney Darby as APIC coordinator. A quality steering group oversaw the program and assigned boards to review each of the categories as well as process action teams to implement improvements.

One of the first acts of the steering group was to establish a customer survey, which showed that the biggest complaint overall was the high cost of Huntsville Center services, which was a direct result of overhead. Measurement of each APIC category was central to the program.

It was, Colonel Cunningham said, "management by fact."

The center submitted its first APIC packet in 1995 and was one of four packages the Corps submitted to the Armywide contest. The 1995 APIC assessment had revealed 24 gaps in processes, which the center began to address. In line with HQUSACE directives, the center set a goal of having 75 percent of its budget under obligation by the third quarter.

Increasing the workload enabled the center to complete more work earlier in the year and correct issues. By 1996, the center reduced by half the number of contracts issued in the fourth quarter.

Also in 1996, the quality steering group organized Huntsville Center services into product lines, each with specific visions, goals, missions, and strategies. The initial product lines included demilitarization, ordnance and explosives, medical, major command support, operational forces support, and facilities support.

By 1997, the center showed marked improvements in all areas. Nearly all customer surveys had shown improvement in responses. The total labor multiplier – a measurement of overhead derived by dividing net revenue by direct labor charges – had declined from 2.97 in 1994 to 2.38 in 1997, which was below the industry median. Overhead rates dropped from 45 percent in 1995 to 28 percent in 1997, a direct result of implementing APIC.

As a result of this progress, the Army named the center's Audit Office the best in the Army in 1997. That year, the center's APIC package won runner up in the Armywide Army of Communities of Excellence program for the fifth time since its inception in the late 1980s. The submission earned the center the Chief of Staff Award for particularly outstanding organizations, and the Army nominated the center for the Presidential Quality Award, a governmentwide contest based on the Baldrige criteria. [9]

Probably more than any other Corps entity, the Huntsville Center operated like a business and had to improve its processes and increase quality to remain competitive. Unlike the Corps districts and divisions, most of the center's work was reimbursable.

Rather than receiving direct funding from Congress to complete work in a geographic area, the center received funds from and managed projects for other agencies that hired the center or contractors to complete work related to the specific areas in which the center had experience or knowledge. At the same time, HQUSACE sometimes assigned the center missions or provided funding for the center to maintain a mandatory or technical center of expertise.

Many of these were temporary in nature, designed to help the Corps become spun up on new technology. However, even in these technical areas, most customers were reimbursable.

The center, therefore, had to reduce overhead to make its rates competitive without sacrificing the quality of its services. The Baldrige criteria and other process improvements clearly helped the center achieve this. After entering the APIC competitions, the center lowered its overhead rates to less than 30 percent for the first time, and customer satisfaction increased.

Today, the Huntsville Center continues to harness information technology to maximize its resources and streamline production. ***(Photo by David San Miguel)***

Leader in Automation

Another way the Huntsville Center improved its efficiency was through the adoption of information technology. The center had been a leader in engineering automation for many years, having been made responsible for deployment, maintenance, and further development of engineering software programs since 1978.

The center remained responsible for three suites of engineering software products. Several applications ran on the Military Construction Programming, Administration, and Execution (PAX) mainframe and network, including the DD1391 Processor, ECONPACK, ENG 3086, and Army Criteria Tracking System (ACTS).

By 1993, the PAX system had more than 1,600 users worldwide and had expanded to include email. Yet most work conducted in the Corps was by this time completed on personal computers in a local area network, versus terminals that signed into a mainframe using a modem. Other than ACTS, which the Corps had phased out by 1993, most of the center's work on these applications after 1992 centered on developing additional modules that allowed offline use of PAX systems on personal computers.

These included modules such as PC-Information Systems Cost Estimation, PC-Print, and PC-Cost for ENG 3086. Finally, in 1996 the center began to port the entire PAX suite to Microsoft Windows, which it completed in 1997.

To assist in this transition, the center also offered helpdesk services for these applications. The second software suite supported by the center was the Engineer Management Automation Army Reserve (EMAAR), which managed Army Reserve projects.

The center released an MS-DOS version of EMAAR in 1993 for use on personal computers, and it completed a version for Microsoft Windows in 1997. This was in addition to making regular updates as required by the Office of the Chief of Army Reserve. The third software suite supported by the center was Computer-Aided Cost Estimation System (CACES) and the micro-computer version released in 1993 (MACES). The center released a Windows version of the application in 1996 and completed migration to a tri-services version (TRACES) by 1997. [10]

While these applications built up Huntsville Center expertise in software development and engineer automation, they were primarily for other Corps entities.

Another major application the center supported, the Corps of Engineers Financial Management System (CEFMS), had major repercussions on center operations. HQUSACE had chosen the center for fielding CEFMS in 1991 because it already managed numerous engineering systems and was located near the CEFMS Redesign Project Office.

The center had trained 90 percent of its personnel on the system in 1992 and established a hotline to report issues. After completing a site survey, the center installed the system by December 15 on 75 personal computers throughout the center. After its implementation, the Resource Management Office took the lead in training and testing the program.

During testing, users identified 700 issues, which software programmers corrected. CEFMS tied together most financial management functions of the Corps in a single application, including project management, contracting, and timecard systems.

It provided access to 62 financial forms, and was one of the first applications to incorporate the use of a common access card or CAC. It resulted in savings of thousands of dollars annually. The Department of Treasury praised the program for its effectiveness.

After more than five years of training and refinement of the system, the Huntsville Center implemented the application Corpswide in 1998. Because it touched so many areas, it improved many Corps processes, starting at the Huntsville Center.

In addition to improving center financial management, CEFMS had another impact on operations. Since so many of

the functions were automated, Colonel Brown pushed to increase computer use throughout the center for most administrative and financial tasks. This automated initiative, in turn, required more computer software training for its personnel in addition to CEFMS and other computer-oriented tasks.

"I saw computerization as inevitable, and I saw it overwhelming the engineering profession. It wasn't something that was optional anymore," Colonel Brown said. Thus, completion of office automation in the center coincided with the implementation of CEFMS. [11]

Perhaps the most noticeable way the Huntsville Center automated its operations was through the development of networking and use of the Internet. Because CEFMS was a networked application that compiled forms from numerous users, it became necessary to install a local area network (LAN) in the center, which was complete in 1993.

By the following year, 95 percent of all computers in the building were connected to the LAN. This allowed increased use of networked communications such as email, which was installed on most computers in the center at this time. Installation of network lines to other buildings and businesses allowed creation of a wide area network (WAN) that connected multiple Corps offices.

Because networked computers required interoperability of computer systems, the center standardized hardware and software throughout the building and eliminated the last remaining legacy microcomputers and mainframes. Fax machines were also installed in most offices.

In addition, the center first implemented video teleconferencing systems. The Training Directorate had experimented with video-based training to six other military installations in the late 1980s, but few installations had the equipment available for such uses. As it became possible to send video data over computer networks, its use increased, and by 1997 there were 26 desktops in the center with video teleconferencing capabilities. [12]

Networking the Center with the rest of the Corps also placed the Huntsville Center at the vanguard of Internet use within the organization.

Computer pioneer Vanevar Bush had first proposed the concept of networked computers containing all human knowledge in 1945 with his concept of the MEMEX. The enabling technology to network computers did not exist, however, until the Advanced Research Projects Agency developed it in 1969.

ARPANet, a network of government and academic computers, was the precursor to the modern Internet. At first, mainframe computers such as PAX were available through phone lines that provided only textual data. Ted Nelson and Douglas Englebart of the Xerox Palo Alto Research Center, California, developed Ethernet network protocols, mouse and window-driven displays, and hypertext.

As part of the World Wide Web project, Tim-Berners Lee added the use of hypertext markup language (HTML), which could link text or images to other pages of data in a networked environment using universal resource locators (URLs), which allowed searches based on names instead of numbers.

Navigating this data required additional software, and in 1993 Marc Anderson developed the first browser software – National Center for Supercomputing Applications (NCSA) MOSAIC. Even at this time, most networks were still accessible only by the military, government, and educational facilities.

In 1995, the government allowed privatization and commercialization of the Internet. While many military organizations were already using it for research and communication, the Huntsville Center was among the first in the Corps to conduct business on the World Wide Web when in January 1996 it announced a $100 million contract on the Internet.

In 1997, the center launched an online helpdesk to support the software products it managed. Through these and other methods, the center remained at the forefront of computing and networking. [13]

Demilitarization Picks up Steam

The Chemical Stockpile Disposal Program (CSDP) made significant progress by 1998. After several years of testing and with approval of the Secretary of the Army in 1993, the Johnston Atoll Chemical Agent Disposal System (JACADS) began full operations in 1994 and had destroyed a quarter of all munitions at the site by 1997.

Although there had been some minor leaks of chemical agents, there was a 99.9999999 percent safety factor, and no major impacts. Construction of the new plant at Tooele, Utah, was complete in 1993, but the Huntsville Center made several modifications based on the difficulties encountered during testing at Johnston Atoll. The Tooele plant began incineration in 1996 at what was the largest stockpile storage area in the U.S. at 43 percent.

"We will continue our operations slowly and deliberately to fine-tune this facility before we move into full-scale operations," said Maj. Gen. Robert D. Orton, Program Manager of the Chemical Demilitarization and Remediation Activity.

The next plant to begin construction was at Anniston, Alabama, where the center had maintained a resident office of 29 personnel since 1994. The Environmental Protection Agency finally approved the Resources Conservation and Recovery Act (RCRA) permit in 1996.

In February 1996, the Army awarded a $575 million contract to Westinghouse for construction, equipment installation, systemization, and operation of the facility, of which the Huntsville Center was responsible for $211 million.

After the state of Alabama approved the permit, construction began in June 1997. Meanwhile, the center continued work on designs for the Umatilla, Oregon; Pine Bluff, Arkansas; Pueblo, Colorado; and Blue Grass, Kentucky, sites and completed them by 1994.

The center issued the request for proposal for building the Umatilla plant in 1994, but the state of Oregon did not approve the permit until 1997. The center awarded the construction contract in February 1997, and construction started in June.

The center also awarded the construction contract for the Pine Bluff, Arkansas, plant in 1997, but permit approval delayed construction. However, Congress delayed construction at Pueblo and Blue Grass to consider alternative methods of destruction. [14]

Despite this progress, the CSDP continued to see cost increases. Cost estimates to complete the program rose from $11 billion in 1995 to $24 billion by 1997, with construction delays being the largest cause of these increases.

As of 1994, construction management was 40 percent of the Corps' portion of the budget. Although some program management issues contributed to cost increases, most were due to congressional mandates or delays in obtaining permits rather than issues with construction, which accounted for only 13 percent of overall costs. Because of public safety concerns, there was considerable protest of the CSDP; several environmental groups filed suit to stop operations at Tooele, and states reviewed environmental permits stringently. Obtaining the necessary permits was the most time-consuming.

"It was an evolving process," said Tooele program manager Bob Smith. Congressional requirements to research alternative disposal methods also delayed construction. There had been considerable protests against the incineration method, and the Army had conducted laboratory tests of alternative methods at the low-volume stockpile sites at Aberdeen Proving Ground, Maryland, and Newport, Indiana, as required by the 1993 Defense Authorization Act. The resulting report recommended continued use of incineration as the most cost-effective.

However, Congress requested a new report on alternative processes in the National Defense Authorization Act of 1997 (PL 104-208) and provided $40 million to develop two pilot projects. As a result of this request, the Army began exploring seven alternative destruction technologies, which delayed construction at the Aberdeen; Newport; Pueblo, Colorado; and Blue Grass, Kentucky, sites.

The Department of Defense made several efforts to control the spiraling costs. In 1994, the Army added CSDP to the Defense Authorization process, forcing the program into normal budgeting. Cost-saving measures taken at that time saved more than $600 million over the life of the program. Among these measures was reorganizing the Chemical Materiel Disposal Agency as the Chemical Demilitarization and Remediation Activity.

In the 1996 National Defense Authorization Act (104-106), Congress directed the Army to reduce program costs, but this would take time. The Nonstockpile Disposal Program faced similar delays; the General Accounting Office (GAO) estimated it would cost $15 billion over 40 years to complete. By 1997, the Army had spent $105 million on the program, but little of it for facilities. [15]

Meanwhile, the Huntsville Center's support of Russian chemical demilitarization increased. In 1992, Russian President Boris Yeltsin signed a new agreement in which the U.S., Germany, and Italy would aid Russia with developing demilitarization processes and facilities. Russia established a Committee for Conventional Problems of Biological and Chemical Weapons of the Russian Federation Concerning the Safe and Ecologically Sound Destruction of Chemical Weapons, which conducted a visit to U.S. demilitarization plants in 1993.

The same year, the U.S. established an office in Moscow June 15 to coordinate with Russia. U.S. support to Russia focused on three main areas: development of a comprehensive implementation plan, construction of a Central Analytical Laboratory (CAL) to develop a disposal process, and construction of a pilot plant. In 1994, the Defense Nuclear Agency, which then oversaw Russian demilitarization efforts, issued a $55 million contract to Bechtel Corporation to help develop the comprehensive plan, but progress was slow.

A U.S.-Russian working group met throughout the year and came to a tentative agreement, but the final program implemented in 1995 was much narrower. Research would proceed in two phases.

Phase one would include tests conducted at Aberdeen Proving Ground on neutralization of VX, Sarin, and Soman gases.

Phase two would proceed in Russia with the goal of obtaining 99.99 percent destruction of VX weapons as judged by a bilateral commission. Both phases were to be complete by the end of 1995.

The plan for destruction largely mirrored the CSDP in that Russia would construct plants at seven sites, including a major storage site for lewisite used in blister agents. The pilot project would be at the Shchuche'ye Chemical Weapons Storage Facility in the Kurgon region of south-central Russia, about 975 miles from Moscow. This was the storage site for 13.6 percent of the Russian stockpile or roughly 5,400 tons of nerve gas. [16]

Construction of the CAL and pilot plant also proceeded. By 1995, Russia had selected a site for the CAL at the Institute of Organic Chemistry and Technology in Moscow.

In 1996, the Defense Nuclear Agency issued a construction contract with support from the Huntsville Center and other Corps elements. Although the Russians agreed in principle to the pilot plant at Shchuche'ye, it did not approve the project plan until December 1996.

At that time, the Huntsville Center issued a $400 million indefinite delivery/indefinite quantity (IDIQ) contract to Parsons

Corporation to oversee Russian design and construction of the plant. Construction started with laying the cornerstone of the facility September 28, 1998. The Parsons contract eventually grew to 18 tasks worth $45.8 million, with a total U.S. investment in the plant of $135 million at that time.

Among tasks Parsons supported was an extended public outreach campaign to build support for the program. The goal was to complete destruction of all stockpiles at the site by 2005 with decommissioning by 2007, but the 1998 economic crash in Russia, which greatly devalued the ruble, put the program nearly four years behind schedule.

Throughout this early phase in Russian demilitarization, the Huntsville Center and indeed all U.S. elements worked through numerous difficulties. There were the inevitable cultural and language differences, which sometimes contributed to differences about deadlines and work schedules. There were also political difficulties in obtaining necessary approvals from Russian bureaucracy, and the fact that the government repeatedly restructured did not help with progress.

"I would have liked to see their program move more quickly," said Bob Smith, who oversaw the Corps team in Russia in 1996, "but the Russians have environmental laws, construction standards and fiscal constraints just like we do."

In general, Russia lacked modern facilities to complete the needed research, and it had inadequate funds to proceed with the program, requiring additional U.S. investment.

In addition, U.S. researchers ran into issues with duplicating the VX neutralization process developed by the Russians, which delayed the pilot plant. Despite these challenges, the U.S.-Russian team was able to make considerable progress. [17]

The Huntsville Center had started to support another demilitarization program in 1992 – disposal of solid rocket motors for the U.S. Army Missile Command (MICOM).

In September 1992, the center had issued a contract to develop processes for safely removing and reutilizing solid rocket fuel from rocket components to allow for destruction of old missiles. After a series of experiments conducted in 1995, the contractor, Hercules Aerospace Company, developed a chemical removal process in 1995 to extract a 200-pound batch of fuel at a pilot facility at Magna, Utah. The process – near-critical fluid extraction – used ammonia and other chemicals to dissolve propellants until only inert material remained, including ingredients such as high-melt explosives.

The "closed-loop" system recycled or reused all ingredients or components, thereby minimizing air and water pollution. In December 1996, MICOM relocated the pilot plant to Redstone Arsenal to integrate it into a comprehensive missile disassembly and recycling demonstration.

In addition, the Huntsville Center continued to support the U.S. Army Defense Ammunition Center and School in researching the feasibility of marketing recycled propellants obtained from this process. [18]

Environmental Programs

The Huntsville Center continued to support the Defense Environmental Restoration Program (DERP) and its two subprograms, the Formerly Used Defense Sites (FUDS) program and the Installation Restoration Program (IRP). The center maintained and continued to add to the FUDS national database, which had grown to 8,000 sites by 1995.

By 1996, it had completed preliminary assessments on all sites. However, construction of most mitigation projects fell under the oversight of local districts, except for those related to ordnance removal. The Huntsville Center still supported those.

Under IRP, the center supported two main customers: the Defense Logistics Agency (DLA) and the Army Materiel Command (AMC).

For the DLA, the center had been conducting groundwater assessments since the program originated, as well as completing site designs for several depots and fuel supply points. Although most of this work had been localized after 1994, the center continued to manage construction at the Defense Distribution or Supply Depots at Memphis, Tennessee; Atchison, Kansas; San Joachin, near Stockton, California; Susquehanna, Pennsylvania; and Richmond, Virginia.

The center also, by 1997, completed 108 storage facility designs of various sizes for the Defense Reutilization and Marketing Service.

In 1993, the center signed a memorandum of agreement with AMC and HQUSACE to allow installations to select the design agent for remediation. The center transferred most AMC sites to local districts by 1994; nonetheless, several bases chose the center as its design agent. One of these, Redstone Arsenal, Alabama, had been the site of both chemical and conventional weapons during World War II as well as missile and rocket development.

It chose the center to support cleaning up the Wheeler Wildlife Reserve that partially overlapped the base, as well as 11 other polluted sites identified in 1988. The center completed the feasibility study for Wheeler in 1998.

Seneca Arsenal, New York, requested assistance in cleaning up waste sites, which was complete by 2000. The center also supported other agencies. Under a 1991 memorandum of agreement with the National Science Foundation, the center managed construction of a storage facility for hazardous wastes at McMurdo Station, Antarctica, over three years, beginning in 1993.

Finally, the center continued preparing reports, including reports related to the BRAC process, to support the Office of the Deputy Assistant Secretary of Defense for Environmental Studies. The center issued contracts related to these efforts in 1993 and 1996. [19]

By 1993, ordnance removal under DERP had evolved into a separate program within the Huntsville Center. HQUSACE had established a Mandatory Center of Expertise and Design Center for Ordnance and Explosive Wastes in 1990. By 1995, work had grown to the point where Colonel Cunningham established an Ordnance and Explosives Directorate.

"A lot of people may not want to remember [Col.] John Cunningham, but he probably changed the direction of the center in a positive way more than any other commander I ever worked for. His focus was a business approach," said David Douthout, who Cunningham named chief of the new directorate.

The following year, Douthout organized the directorate into a team organization. The major responsibilities of the center of expertise were to develop policy, provide training, and evaluate new technologies. A major focus of the center was to write and revise regulations regarding ordnance removal since there were none at the time.

As a result of this work, the Environmental Protection Agency made a major revision to its rules to allow ordnance removal under the Resources Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

The center also first established ordnance removal training in 1994, and it quickly became one of the most popular courses provided by the Training Directorate.

In addition, the center presented papers at conferences, such as the Department of Defense-wide UXO Conference in 1996. Over the course of several years, the center evaluated several new technologies. To support detection of ordnance, it tested various magnetometers and gradiometers, as well as electromagnetic induction and ground-penetrating radar. To inspect ordnance, it experimented with snake scopes, magic lanterns, optical sensors, and even robotics.

It began to leverage geographic information systems, global positioning systems, and databases to correlate data about ordnance locations to better evaluate sites. It also used portable detonation tanks and vapor containment shelters to contain blasts and chemical leaks in order to protect populations. [20]

The Ordnance and Explosives Waste Design Center also assisted with projects to remove ordnance. Most of these projects fell under FUDS or BRAC, with occasional funding coming from the Environmental Protection Agency or other agencies.

In general, ordnance removal followed similar processes as DERP, to include assessments, engineering evaluations, and design and construction of mitigation activities. The main differences were the safety requirements and the need for community outreach through the center Public Affairs Office, particularly with BRAC installations and dangerous sites.

Even as the center continued work on ordnance sites near San Diego, California, and elsewhere, the center started work on its largest ordnance removal project to date at Spring Valley, Maryland.

During World War I, the site had been a chemical weapons and munitions research facility, American University Experiment Station, and during World War II, a Navy Bomb Disposal School, but it was now the site of American University, Wesley Seminar, about 1,600 homes, and several foreign embassies.

Although the site was on the FUDS inventory, it was not until 1993 that contractors discovered buried ordnance. Over the next two years, Corps contractors removed 141 items, including 43 chemical munitions. Because it impacted 30 federal agencies, the site was politically sensitive and required frequent updates to the vice president and Congress.

By 1995, sampling at 260 sites found no chemicals and only four more munitions, leading to a No Further Action Record of Decision. Despite this, the Corps returned to the site several times after 1998, such as when contractors found a munitions burial pit beneath the home of the South Korean ambassador.

The Baltimore District then removed contaminated soil from 171 residences through 2011. This was the center's first major chemical warfare materiel (CWM) site, and in 1996 HQUSACE made Huntsville the Design Center for all CWM. [21]

Two other major FUDS sites where the Huntsville Center had ordnance removal projects were at Buckley Air Force Base, Colorado, and Camp Croft, South Carolina. In 1995, Buckley Air Force Base, near Denver, turned over the Lowry Training Annex to the state land board for use in cattle grazing and residential development. Corps sampling revealed the presence of ordnance on the annex, which was formerly an explosive ordnance disposal (EOD) training range.

After removal of 601 practice ordnance rounds, the Air Force cleared the site in 1999. However, due to state requirements, the site was not cleared for development until 2007. Camp Croft, which had been a World War II-era training camp, was now part of a state park. When preliminary investigations revealed ordnance was present, the center narrowed removal to two time-critical areas and had removed 60 rounds by March 1995.

Among major BRAC sites were Fort McClellan, Alabama; Fort Monroe, Virginia; Savannah Army Depot, Georgia; Pueblo Army Depot, Colorado; and Fort Ord, California. A good example of a non-Department of Defense site was at the Divex Corporation, a munitions manufacturer outside Columbia, South Carolina.

After an explosion there September 6, 1993, the Environmental Protection Agency called the Huntsville Center to assist with clearing the 23-acre compound, which contained 40,000 pounds of explosives and 500 unmarked gas cylinders. [22]

By 1995, the workload of the Mandatory Center of Expertise and Design Center for Ordnance and Explosive Wastes was so great, the Huntsville Center notified HQUSACE it needed assistance managing all projects.

In 1996, HQUSACE announced a plan to decentralize the program by 1999. First, the Ordnance and Explosives Directorate divided its operations into a mandatory center of expertise and design centers for ordnance and CWM to allow for transfer of the design centers. It would work closely with one district in each division to handle execution of the ordnance mission.

For example, the center had often used the St. Louis District to assist with ordnance mapping nationwide. The intent was to create two teams in the east and west (Sacramento and Baltimore districts) that would handle all future design issues while the designated districts in each division would execute removal. It was normal practice for centers of expertise within the Corps to transition from mandatory to technical advisor roles as the Corps became spun up on a new technology or issue.

"We have created the standard for excellence in this important public safety program. Now, it is up to the selected military districts to carry on with that standard," said Bob Nore, who was named as transition team leader.

In 1997, while the Huntsville Center began to evaluate districts and prepare for decentralization, HQUSACE reversed this decision due to the lack of expected growth in the program. While HQUSACE afterward placed execution of the projects in the hands of the trained districts, Huntsville remained a center of expertise and design center. [23]

Forces Support

Despite the decline of the Production Base Support Program, the Huntsville Center continued to support it at low levels. The majority of ammunition plants had been placed in care-taker status by 1993; only eight government-operated plants remained active. This was largely because of the increased reliance on foreign arms manufacturers and a dual-use strategy of finding commercial uses for plants.

By the end of the decade, this had declined to three government-operated and six contractor-operated plants, with another three in reserve. Despite this decrease in active plants and funding, as of 1995 there were 20 sites under construction and 80 plant renovations in design. The total value of these projects at that time was $16 million, a dramatic decline from $44 million in 1991.

In 1995, the Department of Defense transitioned management of production base support to a new Industrial Operations Command. A memorandum of understanding with the Deputy Chief of Staff for Industrial Readiness divided responsibility for the program with this command. Under this arrangement, local Corps districts would oversee design and construction projects.

The Huntsville Center's role after this point was mostly administrative as it transitioned management of the program to others. [24]

The Huntsville Center continued to support efforts to standardize and modernize military construction. Work on the Army Facilities Components System had continued consistently at four to six contracts per year to maintain it.

In 1993, the center developed a software version of the system for the personal computer called the Theater Construction Management System, and the following year the center migrated the software to Microsoft Windows, which greatly reduced the need for printed manuals. The center distributed 256 copies of the software version.

In 1994, efforts began to expand the system to include refugee facilities and camps, and by 1997 the system had grown to include 4,100 facility and 750 installation designs. The Criteria Documents Update Program also continued consistently at 12 to 22 contracts per year.

Major efforts included updating criteria documents to include metric measurements and incorporating revisions based on new seismic studies in 1994.

By 1995, in-house work on the designs had increased by 25 percent to save money, and in 1997 the center placed the guides on the Internet to increase availability. The Operation and Maintenance Engineering Enhancement (OMEE) Program had continued to grow.

The center eventually focused OMEE on five product lines: OMEE planning, OMEE design, simplified facility support, repair and renewal, and Year 2000 (Y2K) code correction. By 1997, the center supported 100 installations for $12 million annually to plan maintenance of mostly aging medical facilities.

In 1993, the center published operation and maintenance design guides and manuals for 20 standard facilities. It distributed 100 copies of these guides. A major innovation was the Simplified Facility Support Process that focused on individual systems such as air quality control instead of entire facilities, which saved 15 to 20 percent and was quickly implementable. The center also helped to modernize control system code to counter the so-called Y2K bug, which would cause disruptions when computer clocks turned over at the end of the century.

Finally, the center continued its support of the Army Range and Training Lands Program Mandatory Center of Expertise. Since 1984, the center had modernized 12 Marine Corps and 400 Army ranges. A major development was fielding of the Range Facility Management Support System, which the center tested at Pohakuloa Training Range, Hawaii. [25]

The Electronic Security Systems (ESS) Mandatory Center of Expertise and Design Center greatly expanded operations over the decade. The center performed surveys, conducted studies, defined research needs, developed criteria, designed systems, managed installation, and completed technical manuals for intrusion detection and other security systems.

In 1997, the center reorganized to include all ESS and submitted a revised management plan. Contractors performed most of the work for the center. In 1991, the Huntsville

Center had issued an IDIQ contract with C.H. Guernsey and Company. On its expiration, the center issued another contract in 1995.

By 1998, the center had issued 60 delivery orders on these contracts. The center also reissued the IDIQ contract to support the U.S. Army Intelligence Command in 1995, although projects for the command greatly declined after this.

By 1997, the ESS Mandatory Center of Expertise and its contractors had completed 100 surveys and projects at 50 installations, as well as 225 California National Guard armories. These projects included several that were high profile.

The ESS team provided security systems for the Pentagon, White House, Smithsonian Institute, Bureau of Land Management, Immigration and Naturalization Service, and the Bureau of Engraving and Printing Western Currency Facility. It had also completed ESS projects at all six chemical demilitarization plants or construction sites in the continental U.S. [26]

In 1993, the Huntsville Center reorganized the Contracting Directorate to include Medical, Environmental, Contract Services, and Special Concepts divisions to closer align support to U.S. forces.

In 1994, the Small Disadvantaged Business Utilization Office moved to the Contracting Directorate, which strengthened efforts to increase contracting with small, disadvantaged, and woman-owned businesses.

In 1995, the directorate introduced a team concept organized according to product lines with teams for chemical demilitarization support, acquisition support, and acquisition services. Its primary services focused on medical acquisition and the Army Reserve, with a significant influx of new work for Army installations. Acquisition for the Office of the Surgeon General remained at a consistent $10 million to 20 million per year to procure medical furniture and equipment. The center issued two new magnetic resonance imaging (MRI) contracts in 1994 for $86.4 million, procured 18 MRIs, and leased 10 others under the contracts. The computerized tomography (CT) contract expired in 1995; by that time the center had completed more than 20 projects.

Also in 1994, the center issued four medical facility renewal contracts, under which it completed 281 task orders. It followed this with another four contracts in 1997 worth $500 million. These were IDIQ contracts with preapproved vendors, which avoided long acquisition processes. Among projects completed under these contracts was a $3.3 million replacement of a chiller plant at the Keesler Air Force Base Medical Center, Mississippi.

In 1997, the center signed a new memorandum of agreement with the Medical Command in which the center would serve as the lead agency for the renewal program and repair, but because of BRAC it would no longer be involved in initial installation of medical equipment. The center had continued to support the Army Reserve with procuring furniture for armories, and this work had reached 32 sites and $24 million by 1997.

That year, because of the growing maintenance requirements, the center transferred the program to the Louisville District.

In 1994, the center signed a memorandum of agreement with the Assistant Chief of Staff for Installation Management to support the Army Barracks Renewal Program, which included renovation of barracks on major installations. The center prepared budgets, developed specifications, evaluated and awarded contracts, and oversaw delivery.

From 1995 to 1997, the center completed 200 acquisitions per year averaging $800,000. For its outstanding service, the Huntsville Center contracting directorate received the Department of the Army Award for Excellence in Contracting in 1997. [27]

Energy conservation programs remained an important service provided by the Huntsville Center. As Mandatory Center of Expertise for the Utility Monitoring and Control Systems, the center held 42 design courses through 1993 and developed and maintained a list of coordinators in each district.

It assisted with designs at four sites: the Pentagon; Fort Hood, Texas; Fort Stewart, Georgia; and Fort Carson, Colorado. The center continued to support several energy contracting programs. Although funding for the Energy Conservation Investment Program had reached a steady $20 million per year, most installations lacked personnel to pursue the program. [28]

The center transferred the program to the Mobile District in 1993, and the funding expired in 1996. After elimination of tax incentives in 1986, interest in Third-Party Contracting had declined. There were no new third-party contracts in the U.S., although there were some outside the U.S. Likewise, although the center completed Demand-Side Management contracts at Fort Irwin, California, and Fort Bliss, Texas, interest had largely died down by 1996 due to lack of incentives.

The most successful conservation program was the Energy Savings Performance Contracting (ESPC), formerly the Shared Energy Savings program, in which contractors and the government split savings from energy conservation measures.

"This is an example of the government working a lot smarter and more efficiently," program manager Bob Starling said. Fort Polk, Louisiana, was one of the first to take advantage of these contracts, saving $44 million over 20 years, with a government share of $9.9 million.

In 1994, the center prequalified vendors under the program, and in 1995 issued the first contract to these vendors. In January 1997, the center awarded a multistate 10-year ESPC contract worth up to $350 million for bases in four states to order energy services. It added six more contracts over the year in anticipation of continued growth in the program.

The center also added two new energy contracting programs

after 1992. The first was the Maintenance, Repair, and Rehabilitation contracts.

In 1992, the U.S. Forces Command (FORSCOM) raised problems maintaining energy systems on government installations. As a result, the center developed contracts parallel to the medical renewal and OMEE contracts to support maintenance of utilities and energy systems.

In May and June 1997, the center issued three five-year IDIQ contracts for installations and issued $20 million in task orders in 1998. These contracts saved 5 percent on maintenance and cut time to complete most repairs from 240 to 45 days on average. In one case, the contractor replaced a boiler in a record-setting five hours.

"It's not only our program, it's our philosophy," Starling said. "We keep trying to find ways that the installation can always afford the kind of service that a private customer gets."

The center also supported privatization of utilities. With the military downsizing under BRAC, the Army lacked the manpower and resources to modernize utilities to meet new safety and environmental laws.

Beginning in 1997, the Department of Defense launched the Defense Reform Initiative and released a series of directives to transition the department to more sustainable and efficient operations. In Defense Reform Initiative Directive 9, the Department of Defense set a goal of privatizing all base utilities by 2000.

As early as 1995, FORSCOM had requested center support in developing contracts to transition to privately-owned utilities, starting with Fort Belvoir, Virginia, and Fort Leonard Wood, Kansas. However, the initiative greatly increased this activity, which grew to 15 installations by the end of 1997. [29]

Although most of the Huntsville Center's energy work was through contracts that encouraged conservation, it also continued to support fuel management as it has since 1979.

In 1991, the center became the project manager in support of the DLA Defense Fuel Supply Center to help develop manuals for operation of contractor-operated fuel points and pipelines. In April 1992 and July 1993, the center issued contracts to Fluor Daniel and Parsons to assist with research and to help write the operations manuals.

In 1993, the contractors performed aerial and site surveys of Defense Fuel Supply Points at Anchorage, Alaska; Grand Forks, North Dakota; Searsport, Maine; Cincinnati, Ohio; and three sites in California. Sites at Melville, Rhode Island, and Tampa, Florida, were placed on hold pending the outcome of BRAC. The usual process in developing manuals included completion of surveys, analysis of hazards, and historical research of the pipeline area. When such data was not available, the contractor had to manually locate pipelines, as one had to do in Charleston Air Force Base, South Carolina.

By 1995, the center had reviewed and released manuals for 10 of 14 fuel points by 1995. They completed two more over the next two years, so that only manuals for Defense Fuel Supply Points in Cuba and Spain remained in progress in 1998. [30]

Advanced Technology

By the end of the George H.W. Bush administration, the National Missile Defense (NMD) program had come under increased criticism for its cost overruns and lack of progress. The GAO had severely criticized the Strategic Defense Initiative Organization (SDIO) for overstating the success of interceptor tests and especially of Brilliant Pebbles, a series of light-weight and inexpensive space-based interceptors.

This led Democrat Rep. John Conyers of Michigan to comment, "The Star Wars program is floundering. They haven't a clue where they are going or how to get there."

When William J. Clinton became president in January 1993, he immediately put the NMD program on hold to complete a review.

In May, Secretary of Defense Les Aspin declared the era of Star Wars over, made severe budget cuts in NMD, and reorganized the SDIO as the Ballistic Missile Defense Organization (BMDO) reporting to the Assistant Secretary of Defense for Acquisitions and Technology. Instead of 80 percent of the SDIO budget as in 1992, the NMD program used a mere 20 percent of the BMDO budget in 1994 and focused entirely on antiballistic missiles.

After the election of a Republican majority in Congress in 1994, Congress quickly reinitiated the program. Although Clinton vetoed legislation to deploy an NMD by 2003, he did sign the 1996 Defense Appropriations Act, which provided $745 million to continue developing an NMD to counter accidental or rogue launches from nations such as North Korea.

In 1999, with Clinton weakened by scandal, his new Secretary of Defense William Cohen pledged $6.6 billion over five years to develop an NMD. The program as envisioned was two-tiered, with lower- and upper-atmosphere interceptors launched from one or two sites. The HEDI missile evolved into the Kinetic Kill Vehicle Integrated Technology Experiment (KITE), and the ERIS missile became the Kinetic Kill Vehicle (KKV).

Cohen also supported withdrawing from the Strategic Arms Limitation Talks (SALT) Treaty if Russian did not agree to amend it. [31]

The Huntsville Center had continued to support the NMD program through design, procurement, and contracting support for radar and interceptor test facilities. Continuing its work from 1992, the center had actually completed the test facility design for the Ground Based Radar-Test (GBR-T) on Kwajalein Atoll and designs for the Ground Based Interceptor (GBI) and Ground Based Entry Point (GEP) facilities on Meck Island, Kwajalein, and Roi-Namur Island. The GEP was a communication interface between the GBR and GBI. The facilities had proceeded as far

Military personnel examine a Scud missile shot down in the desert by an MIM-104 Patriot tactical air defense missile during Operation Desert Storm. ***(U.S. Army photo)***

as awarding a construction contract for the GBR-T when the BMDO canceled the contracts in 1993.

However, work continued on hardness and survivability testing of a No Upset Processor for computers with the award of a 5-year research contract in 1993; fabrication of the processor started in 1997. When the NMD program restarted in 1995, the BMDO requested center support of several projects.

In January 1996, the center published the North Dakota NMD Treaty Compliant Siting Survey Report of the old Mickelson SAFEGUARD facility, which included initial site layouts for NMD facilities at that location. The BMDO requested additional supplements, including a siting study for North Slope, Alaska, which was particularly challenging because of the frozen foundations. The center completed this study in 1997.

In the meantime, it proceeded with a new design for a Ground Based Radar-Prototype (GBR-P) in 1995, which was complete in 1996. The Honolulu District awarded the construction contract for the facility, which was complete by September 1997. In addition, the center completed the site survey and design of the In-Flight Interceptor Communications Systems test facilities on Kwajalein and Roi-Namur, which proceeded to construction in 1997. Redesign of the interceptor facility was 35 percent complete by the end of 1997. Although the NMD program focused on antiballistic missiles, the center also started design of a Space Based Laser test facility, which included the largest vacuum chamber in history at 100 feet long.

The center completed and submitted the design and siting study March 5, 1998, and expected a decision from the BMDO by 1999. Like previous missile defense projects, these projects suffered from an urgent schedule that required simultaneous design of facilities without a full knowledge of sites or technology issues.

However, as old pros, center engineers worked proactively to meet changes in designs and schedules and delivered most products on-schedule and under budget. [32]

More critical for the Clinton administration was the Theater Missile Defense (TMD) program, designed to protect a smaller region from missile launches.

The TMD program originated in 1975 with development of a surface-to-air missile defense system that became the Patriot system. After successful launches protected Soldiers from Iraqi SCUD missiles during the Gulf War in 1990, the Patriot became a popular missile defense program.

In a related program, the U.S. agreed in 1986 to assist Israel in developing the Arrow antiballistic missile. Based on this program, the U.S. created a TMD Program Office in 1986. Although the initial test of the Arrow in 1990 failed, the Army did conduct a successful test in 1992. The most popular TMD program, however, was the Terminal High Altitude Area Defense (THAAD), which was the U.S. version of the Arrow.

Conceptualized in 1988, the Army awarded the development contract to Lockheed Martin in 1992, which conducted the first successful test of THAAD in 1995. It would eventually replace the KKV as the exoatmospheric missile under the NMD program.

President Bush had emphasized the TMD program under the Global Protection Against Limited Strikes program in 1991, although he had maintained much lower funding than for NMD.

President Clinton and Secretary Aspin had reversed this decision and made TMD the central program of the BMDO – 80 percent of its budget verses 20 percent previously.

In anticipation of system deployment, Clinton obtained an agreement with Russia in the Strategic Arms Reduction Treaty (START III) of 1997 that exempted from SALT THAAD and other ground-based systems slower than 5.5 kilometers per second.

In 1994, the BMDO requested the Huntsville Center to complete site surveys, studies, criteria development, and designs of test facilities at Fort Wingate Depot Activity, New Mexico; Key West, Florida; Kwajalein; and Wake Island for both the THAAD and Patriot Advanced Capability-3 (PAC-3). The center completed design of the Fort Wingate THAAD target launch pad in 1995, and the Fort Worth District awarded the construction contract.

The center completed the remaining THAAD facilities from 1996 to 1998. Despite changing specifications, it also completed a PAC-3 assembly plant design in 1996, and the Fort Worth District awarded the construction contract later in the year. The contractor completed the facility in September 1997. [33]

Work on the advanced solid rocket motor facility for the National Aeronautics and Space Administration (NASA) had continued into 1993.

After NASA had accepted the first facility at Yellow Creek, Mississippi, in December 1992, construction of the remaining facilities advanced quickly. The Huntsville Center had continued to coordinate on design corrections with a budget in fiscal year 1993 of $2.1 million. However, due to cost overruns, the program ended when NASA sent a termination letter to contractors October 19, 1993.

Termination proposals were due to NASA in May 1994. Corps support of the project wound down with closure of the project office in January 1994 and end of all support March 26, 1994.

Despite this, the center's relationship with NASA continued through several engineering studies involving 3-dimensional, or 3-D, modeling. For example, the center oversaw a contracted study of meteorite impact on the International Space Station for the NASA Debris Working Group. It also completed an in-house study of hypervelocity impact and continuum mechanics. During the same period, the center also completed 3-D modeling studies for the Defense Nuclear Agency and the MICOM Hellfire Missile Demonstration. With the development of more powerful computers with advanced graphical capabilities, 3-D modeling had become much more common in engineering studies, and many agencies took advantage of this technology. [34]

Research into magnetically levitated or MAGLEV trains had also continued. The Bush administration had not requested funding under the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1992 until completion of the work of the National MAGLEV Initiative (NMI), of which the Corps was a leading member. The NMI completed its report in September 1993. The report compared the possibility of using an existing prototype along the German model with electromagnetic suspension, a joint venture to improve either German or the Japanese model with electrodynamic suspension, or a U.S.-developed system.

Although use of the existing German model was cheaper, it had a much lower performance. A U.S. developed system, although likely to be more advanced, was more expensive, but such a venture could find fast reimbursement by implementing a system in just one of eight major inter-city corridors.

The report recommended a U.S.-developed prototype within the framework of ISTEA. However, Transportation Secretary Federico Pena chose not to request funding for developing the prototype under ISTEA and instead initiated a 5-year High Speed Ground Transportation Initiative in April 1993 that included MAGLEV and other high-speed rail technologies. As part of this initiative, he requested additional funding for MAGLEV research. [35]

The Huntsville Center had carried $1 million in funding into fiscal year 1993 and continued to aid in planning a federal role in developing a MAGLEV by completing market and technology analyses for the NMI. Once the NMI completed its work, the Army did not request any additional funding for fiscal year 1994.

However, the Federal Railroad Administration received an additional $20 million for MAGLEV research, and the center continued at a low level of support to provide program management, technical support, cost analyses, and research into magnetic effects on steel reinforcement. Among several ideas the center supported was an attempt to develop a local prototype.

In December 1993, Huntsville civic leaders met with Alabama Governor Jim Folsom Jr. to obtain funding for a 20-mile MAGLEV test facility from Huntsville to Decatur, Alabama, or as part of a proposed Memphis to Atlanta Highway, but the Alabama Department of Transportation decided not to pursue a prototype due to lack of available funding.

The Transportation Equity Act for the 21st Century (PL 105-178), signed June 9, 1998, included a MAGLEV deployment program as a private-public partnership. Although the federal Department of Transportation had made no decisions on the direction of this program by the end of 1998, the center continued discussions with the department and the Federal Railroad Administration to support a MAGLEV prototype whenever the government made the decision to deploy. The Corps completed its own recommendations in a 1998 report based primarily on research for the NMI but with updated modeling and verification. [36]

On October 21, 1997, not long after the Army had nominated the Huntsville Center for the Presidential Quality Award, Chief of Engineers Lt. Gen. Joe Ballard held a town hall meeting in Huntsville to celebrate the occasion. General Ballard praised the center's quality program while stressing the need to continue to improve quality, seek growth opportunities, and invest in people.

"We must reinvent ourselves to meet emerging customer needs," he said.

Since adopting APIC, the Huntsville Center had been doing just that by reducing overhead and increasing customer satisfaction. General Ballard also addressed his vision of the center.

Although some Corps districts looked on the Huntsville Center as a "poacher" that stole work that would have gone to geographic elements, he argued that the center brought a unique mission set that complemented the capabilities brought by the districts as part of a team concept – all Corps elements working together.

The following year, Colonel Cunningham accepted the Presidential Quality Award at the Ronald Reagan Building in Washington, D.C., June 17, 1998.

"With lower budgets and less people available to help, we had to become resourceful," Cunningham said in his acceptance speech. It was a candid admission that, while the center had become more efficient, it had done so out of necessity in the face of reorganization and downsizing that had followed BRAC. [37]

Yet even in the face of such challenges, the Huntsville Center had become more efficient and so continued to serve the Corps community. It continued to make progress on its largest missions of demilitarization and ordnance removal, its high-tech missions of supporting missile defense and MAGLEV research, and its support of U.S. forces through expertise in range management, energy conservation, electronic security, and medical procurement.

The center had now been supporting most of these missions for more than two decades. As the center entered the 21st century, it continued to mature in its role as a center supporting other Corps districts and divisions in national or international missions that were technically complex, geographically dispersed, or that required standardization or centralized management. To be successful, the center had to continue increasing its productivity.

End Notes for Chapter 6

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7

The Huntsville Center Matures, 1998-2008

In January 2008, the 16th commander of the U.S. Army Engineering and Support Center, Huntsville, Col. Larry D. McCallister, was celebrating the beginning of a new year.

Writing to the center, he noted, "The Army is changing at a rapid pace and we must be prepared to change with it. But we can't lose focus on other missions either."

Following the first foreign attack on U.S. soil since World War II on September 11, 2001, and two ongoing wars in Iraq and Afghanistan, the Army was growing in size and realigning its units, and installations had to be ready to support new tenants.

A new round of Base Realignment and Closure (BRAC) began in 2005, resulting in work for the center across multiple areas. The chemical demilitarization mission was winding down, but the ordnance removal mission was increasing. The center was leading the transition to new information technology systems and adopting new process improvement methods.

"We are using a unique approach that Headquarters is looking to use at other Corps offices based on our success," McCallister referred repeatedly to principles of "Good to Great," based on the book by Jim Collins, which the new Chief of Engineers, Lt. Gen. Robert L. Van Antwerp, had adopted as his mantra when he entered office in June 2007.

It was recognition that, no matter how great an organization is, there is always room to grow and improve. When General Van Antwerp visited Huntsville in April, he recognized the accomplishments of the center. "I have a tremendous amount of confidence in you all," he said. [1]

The Huntsville Center had, indeed, improved. Although the center had supported a fairly consistent mission set since 1980, it had only been a support center for a little over a decade.

No longer a Corps division, the center had to prove its value in the late 1990s and early 21st century by continuing to increase its productivity and cost-effectiveness to maintain its cost-reimbursable customer base. It had continued to improve quality even as it pursued growing missions in ordnance removal and installation support – a broad area that included procurement, range design, space reduction, electronic security, energy conservation, and medical contracting.

Meanwhile, other Corps missions, including chemical demilitarization and missile defense, entered long-term operation and maintenance or deconstruction as construction ended on major facilities.

By the end of 2008, the center once more held the largest number of centers of expertise in the Corps as the Headquarters of the U.S. Army Corps of Engineers (HQUSACE) continually relied on the center to oversee its most technically complex and geographically dispersed missions.

Growth and Competitiveness

With its status redefined after 1995 and with the introduction of additional efficiency improvements under Total Quality Management (TQM) and the Army Performance Improvement Criteria (APIC), the Huntsville Center grew rapidly over the next decade as it proved its value to the Corps.

From 1998 to 2007, the total mission of the center doubled from $500 million to nearly $1 billion annually. The number of center employees also grew from 502 to 550 by 2007.

There had been some consolidation of centers of expertise in the Corps by 1998, but the number assigned to the center afterward increased from seven to 14, including the addition of the Medical Facilities Center of Expertise (MX), Installation Support Center of Expertise (IS CX), and the consolidation of the Hazardous, Toxic, and Radioactive Waste (HTRW) Center of Expertise with the Military Munitions Center of Expertise (MM CX) as the Environmental and Munitions Center of Expertise (EM CX).

Thus, there was growth both in the amount of business and overall responsibilities of the Huntsville Center. To support these new business lines, the center realigned its directorates.

By 2000, the Chemical Demilitarization and Chemical Demilitarization Construction directorates combined as a single directorate, and the center stood up an Installation Support Directorate and Ballistic Missile Defense Directorate.

By 2007, after a reorganization study, the latter two combined as a single Installation Support and Programs Management Directorate. The center continued to study reorganization in strategic planning workshops held throughout 2008.

In February 2008, the center created a Pre-Award Branch in the Contracting Directorate to better address the entire contracting lifecycle. In addition, each directorate continued to use a teaming approach instituted by Colonel Cunningham in 1995.

In this, organizations created informal groups – often by function or area of focus – that sometimes did not reflect offices as they appeared in organization charts. This had proven extremely useful in creating additional synergies and efficiencies of work.

Finally, with the retirement of Dwight Burns in 2000, the

center lost its senior executive service position equivalent to a general officer, which had provided continuity and represented the center to Corps headquarters.

Since there had not been a general officer at the center since 1981, it was appropriate to reduce the rank of the senior civilian to the same as the commander. [2]

At the same time, the relation of the Huntsville Center to the rest of the Corps continued to evolve. As a member of the Corps community, the center participated in the same global activities, such as programs for charitable giving. Center personnel volunteered for broader Corps missions.

After the 2001 terrorist attacks, 90 personnel volunteered to deploy as civilians in Operation ENDURING FREEDOM and 70 in Operation IRAQI FREEDOM; and a similar number volunteered to respond after the "Florida Four" hurricanes (Charley, Frances, Ivan, and Jeanne) in 2004 and Hurricane Katrina in 2005.

In 2005, these included 12 personnel on the center's housing team, as well as Commander Col. John D. Rivenburgh, who served as deputy engineer of Joint Task Force Katrina. There remained some who viewed the center as "poachers," who hunted for work in other districts.

Due to budgetary cuts in the late 1990s, there were fewer dollars available for agencies and installations to spend on services, which made competition fiercer. In that environment, the center offered a competitive choice in which its greater productivity was paramount.

Col. John D. Rivenburgh
August 2003 - July 2006

Col. Larry D. McCallister
July 2006 - June 2009

"People were fighting for the same dollars," explained Charles Ford of the installation management support and programs directorate. "If we support the customer better than other people, why not do it?"

As the first decade in the 21st century advanced, this situation improved as more funding and work became available, and increasingly other Corps organizations saw the center as a resource to assist in completing critical work.

"Most districts now have more work than they can handle," said Colonel McCallister in 2006. "The districts have their plates full and are trying to hand off work to us."

Similarly, the center often started a project only to later hand it off to the local district for execution. This was partly the result of the "One Door to the Corps" vision embraced at that time. All customers came to the Corps as a whole rather than an individual part. It did not matter if it was the center or local districts that did the work, as long as the customer was happy with services received for the cost. [3]

To maintain satisfied customers, the Huntsville Center had to continue its march toward quality.

Productivity continued to increase under the Army Performance Improvement Criteria (APIC), which the center adopted in 1995.

In 1999, the Quality Management Office in the Office of the Secretary of Defense completed an audit of the center, which confirmed that quality improvements resulted in $107 million in savings.

"Since implementing the team structure and other process improvements in 1995, Huntsville Center has received a plethora of awards and other recognition of its excellence," wrote auditor Anna D. Gowans Miller. Since the center could not measure success by profitability, it developed a "scorecard" that evaluated competitiveness.

As of 2001, the center reduced expenditures from 11.3 to 7 percent, cut overhead costs in half since 1995 to 21 percent, and increased workload per employee from less than $800,000 to more than $1 million. Customer satisfaction rose from 3.75 to 4.15 out of 5.0. As a result, the center won the President's Quality Award in 2001.

Its efforts were so successful that HQUSACE made the center its project manager for the Corps business process initiative.

Despite these successes, the center stopped using APIC in 2002. The decision was due in part to changes in the Army Communities of Excellence competition in 2000 restricting it to installations only, but the center had improved productivity as much as it could and needed another avenue to continue to increase quality.

"We were struggling with being a quality driven organization," said Colonel Rivenburgh. "How do you execute your process from one [project] to another?"

To achieve these gains, in August 2003, the center's leaders voted to pursue International Standards Organization (ISO) 9000-compliance. Established in Europe, ISO was popular in the manufacturing sector and emphasized documentation of business processes and standards, which usually resulted in consistency of operations and elimination of redundancy.

It served as a baseline for evaluating system improvements. In 2004 and 2005, center personnel attended ISO training.

Over the next two years, the center developed a series of formal quality procedures and work instructions that guided everything from document control and management review to travel, security, and work environments.

The center obtained ISO 9000 compliance March 31, 2007. At the same time, the center also adopted Lean-Six Sigma, which combined the two quality improvement approaches. The Army adopted Lean-Six Sigma in 2006. The center had already adopted some of its concepts under APIC, and the program closely fit with ISO 9000, which also focused on documenting processes.

In 2007, the center instituted a "Greenbelt" program to train personnel on Lean-Six Sigma, and by 2008 it had 25 trained greenbelts. [4]

Meanwhile, the center also continued to increase efficiency through information technology.

In 2002, the center created its own Microsoft Active Directory based on Microsoft Windows NT Server, which connected all users in the building in a shared workspace that enforced consistency and allowed greater interoperability.

It installed or upgraded software such as Microsoft Office 2003, which included the Outlook email program; the National Security Personnel System, which automated the processing of security clearances for employees; and Automated Heat Tickets, which sped the creation and assignment of maintenance requests. It also instituted an electronic library of documents, primarily in Adobe Acrobat, that quickly replaced the need for a paper library.

At the same time, the center's engineering directorate continued to develop and enhance engineering software for the Corps. It greatly expanded the Programming, Administration, and Execution (PAX) system's user base in 2004 through the addition of National Guard users and had regionalized the maintenance of forms to make them faster to access. Most of these capabilities, such as the DD 1391 Processor, were now available on the Internet. Congress used the system to submit an electronic budget for the first time in 2000. The center continued to improve the applications, for example, releasing Version 3.0 of ECONPACK.

In 2004, HQUSACE named Huntsville the Technical Center of Expertise for DD 1391 and ENG 3086 documentation. The center converted the Historical Analysis Generator module of Tri-services Automated Cost Evaluation System (TRACES) to a web-based program to make it more accessible, and in 2002 the center released MII, the latest version of the Micro-computer Automated Cost Evaluation System (MACES), which had grown in popularity with the increase of design-build contracts in which cost estimates were critical.

It also upgraded the Parametric Cost Engineering System (PACES), part of the TRACES application that developed cost estimates based on models using minimal existing specifications and costs. The upgrade included integrating it with PC-Cost PAX interface and applications such as CostRisk to develop risk estimates based on cost.

The center continued to provide training on these systems, including the addition of ECONPACK. Thus, both internally and externally, the center pushed forward the use of computers to enhance the efficiency of the center and Corps community. [5]

Perhaps the greatest organizational change that occurred in the center and indeed Corps-wide was the conversion of all information technology (IT) functions in the Corps to a public-private partnership.

In 2004, the Corps announced its intention to hold an A-76 competition for IT. First issued in 1966 and updated numerous times, Bureau of Budget Circular A-76 established the process for determining whether a government activity should be performed internally, by another agency, or by the private sector, usually through a competition pitting the government against contractors.

After a 2001 General Accounting Office (GAO) report suggested A-76 competitions could reduce operational costs, President George W. Bush established a goal of competing at least 15 percent of commercial positions in government. With 1,300 employees impacted (30 in Huntsville), Corps IT was one of the largest activities ever submitted to an A-76 competition.

The U.S. Army Engineer Research and Development Center (ERDC) led the competition, in which it formed a public-private partnership to compete against other contractors.

ERDC partnered with Lockheed Martin to establish a new company – Army Corps of Engineers-Information Technology (ACE-IT) – that worked with the Corps and included former Corps employees. After benchmarking the old organization, the competition proceeded.

On April 19, 2007, the Corps announced that ACE-IT had won the contract to manage IT services with an anticipated savings of $1 billion over five years. Although many complained about the transition during the first year, ACE-IT was much more efficient. It reduced employees from 1,300 to 950, mostly through attrition, but it also reduced the number of IT contracts in the Corps from 1,500 to one and reduced the number of help desks from 63 to one.

ACE-IT was headquartered initially out of ERDC in Vicksburg, Mississippi, but, as with other Corps organizations, the Huntsville Center maintained local IT personnel, who transferred to the new company. The center volunteered to serve as a pilot project to work out any issues with ACE-IT, as it had with other Corps computer systems. The first major issue faced by ACE-IT was a Corps-wide equipment refresh in 2008 to update all computers and printers. [6]

Ordnance Removal

After 2000, the Huntsville Center's ordnance removal program increased greatly, even as other environmental work declined.

In 1998, ordnance removal accounted for $48 million or 9.3 percent of its budget. By 2007, this had increased to $244 million or 44 percent, making it the center's largest activity.

In 2001, the Department of the Army reorganized the ordnance program as the Military Munitions Response Program (MMRP) under the Defense Environmental Restoration Program (DERP). This allowed the center to handle munitions separately from other environmental mitigation and ensure required safety.

Over several months, the Corps developed an MMRP strategy – the Military Munitions Support Services (M2S2), which integrated business practices for base clearance, range clearance, and restoration projects under both DERP and BRAC.

The initial focus of MMRP was to complete an inventory of all ordnance sites, prioritize them, and establish goals. The Army Environmental Center created the inventory in 2001, and the Huntsville Center prioritized sites based on hazard level. It finalized the resulting metric, the Munitions Response Site Prioritization Protocol, in 2005.

At the same time, HQUSACE renamed Huntsville as the MM CX and Design Center. Although these were initially closely connected, by 2007 they operated as separate entities.

The center of expertise provided program management and budgeting support for HQUSACE, established safety requirements, and maintained quality control for projects through review of plans and paperwork. It also conducted initial site inspections to determine the need for removal efforts. The Corps set a goal of completing 817 site inspections by 2010; as of 2008 center contractors had completed 134.

The design center supported design and contracting of removal actions, oversaw projects, and enforced safety and other standards. HQUSACE maintained the design center in Huntsville, but it also established additional design centers at the South Pacific Division, Omaha District, and Baltimore District.

For safety reasons, it maintained only a single Chemical Warfare Materiel (CWM) Design Center in Huntsville. As it had planned since 1996, HQUSACE completed decentralization after 2001 by "franchising" execution to "removal districts" – Los Angeles, Omaha, Sacramento, Baltimore, Louisville, Mobile, Savannah, Honolulu, and Fort Worth – for which the center provided oversight and planning. [7]

Two of the larger responsibilities of the center of expertise and design center were to continue to evaluate new technologies and support communications.

Ordnance removal technologies had advanced rapidly over the decade, and in 2002 the Huntsville Center established a four-year technology demonstration at Aberdeen Proving Ground, Maryland, with ERDC to test several important developments and conduct fragmentation control experiments. The technologies evaluated ranged from new and smaller blast containment shelters to remote-controlled bulldozers and robots. The most innovative containment technology was the yellow cylinder, a water-filled plastic cylinder that prevented dispersion of shrapnel.

There were several new detection devices, such as the Berkley UXO Discriminator, which not only detected but characterized the type of material.

A number of computer-based technologies aided in analyzing sites, such as the Mapping Explosive Safety Hazards (MESH) Geographic Information System (GIS) used to map out ordnance locations, or the D2Puff software, which accurately predicted drift of chemical plumes based on weather conditions.

One of the more important imaging technologies was the BuckEye System developed by ERDC, which converted high-resolution imagery to terrain data, enabling 3D exploration of ordnance sites. This supported new methods such as digital geophysical mapping, which used sensor and global positioning data to create a digital record of surveys.

In addition, there were numerous improvements in communication, through the use of cell phones, portable global positioning systems, and the Internet to distribute information about sites. The latter proved particularly important in helping the Corps manage expectations about removal projects, which were often public affairs nightmares due to the frequent criticism of the level of hazards, the lengthy removal efforts, and the inconveniences they caused.

Since 1993, the Department of Defense had used Restoration Advisory Boards as a public meeting to explain projects, and they often erupted in criticism. In 1999, the Corps published Engineer Pamphlet 1110-3-8, which formalized public participation guidelines.

The center's public affairs office assisted removal districts in conducting such meetings, preparing fact sheets, or presenting information, including through a quarterly newsletter, *The Corps Environment*, and the internet. [8]

In November 2007, HQUSACE greatly expanded the Huntsville Center's environmental mission with the creation of the EM CX.

The HTRW Mandatory Center of Expertise had existed since 1991 in Omaha under the Missouri River Division. By 2007, it had more than 40 employees, most with advanced degrees. The center conducted quality assurance for all Corps environmental sites and ensured compliance with environmental law.

While the districts actually performed the work, the center provided necessary expertise to develop Corps environmental policy, review project documentation for consistency with national standards, train district personnel on environmental issues, and provide guidance and technical support on Corps projects.

A major accomplishment was award of $450 million in fixed-price contracts, which the districts used to execute work.

However, the center had faced long-running difficulties in that many districts – including the Omaha District – treated it as a local rather than a national resource.

After the retirement of Director Dr. Marcia Davies, HQUSACE sought to improve synergies with the MM CX by creating an umbrella organization under the authority of the Huntsville Center.

Since it had strong support from the local community and already had remote offices at the Fort Worth District and Denver, Colorado, Colonel McCallister chose not to relocate the center and even selected long-time employee Sandi Zebrowski as the new director of the combined organization.

"We owe him a lot because he really worked at making this arrangement work," Zebrowski said. Thus, all Omaha District employees assigned to the HTRW CX transferred to the Huntsville Center on paper, but remained in Omaha. [9]

The MM Design Center, meanwhile, supported several prominent projects through contracting efforts.

In 1999, the Huntsville Center issued indefinite delivery/ indefinite quantity (IDIQ) contracts worth $200 million to three companies to respond to ordnance issues. This saved time in having to individually compete contracts for each project, which were often time-sensitive.

In 2004, it expanded this to $525 million in IDIQ contracts to seven contractors with one base year plus four years of options.

Work continued on several previously identified projects, including Camp Croft, California; Buckley Air Force Base, Colorado; Spring Valley, Maryland; and Fort Ord, California. The center also started several new projects.

From 2003 to 2006, center contractors helped clear Schofield Barracks Military Reservation on Oahu, Hawaii, to reconfigure ranges for a new Stryker Brigade Combat Team.

When contractors found two chemical rounds, the site became a critical CWM site, which operated under much more stringent safety rules. After removal of 140 additional chemical munitions, the contractor completed the initial clearance in 2006, although it continued to support construction of the training ranges.

Another major site was Camp Sibert, Alabama, where the Mobile District called in the Huntsville Center after identifying 532 anomalies, including CWM. By 2007, contractors had removed 11,420 items.

A major ordnance effort involved clearing ranges on active Army bases, including Fort Irwin, California; Fort Drum, New York; and Fort Campbell, Kentucky. Contractors removed 2 million pounds of scrap metal at Fort Campbell alone.

"There is now a Department of Defense directive that requires installations to conduct long range planning which includes everything from firing to cleanup to ensure range sustainability," said Glenn Earhart, the business development manager for the Ordnance and Explosives Directorate.

As part of these services, the center worked with the Environmental Protection Agency to treat lead in the groundwater. The National Guard Massachusetts Military Reservation near Boston is the most prominent example of where the center provided these services. These projects were difficult, but the center consistently received accolades for its work.

In 2007, it received the Army Environmental Command Design Team of the Year Award, and it received several Special Environmental Cleanup Awards. [10]

After decentralization of most environmental mitigation to the districts under DERP, the non-ordnance environmental mitigation work of the Huntsville Center had declined greatly. Nevertheless, the center's Engineering Directorate continued to support several ongoing actions under the Installation Restoration Program, and many installations continued to request center support for mitigation actions.

One of these was Redstone Arsenal. A former chemical weapons production and storage facility, the base had been on the National Priorities List under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) since 1991 and finally obtained funding to begin investigations that led to cleanup of multiple sites.

Under CERCLA, the center also supported the Environmental Protection Agency with value engineering analysis of the Superfund program, which identified savings of $30 million from nine projects worth $217 million. The center continued to support groundwater monitoring for the Defense Logistics Agency (DLA), as it had since 1982.

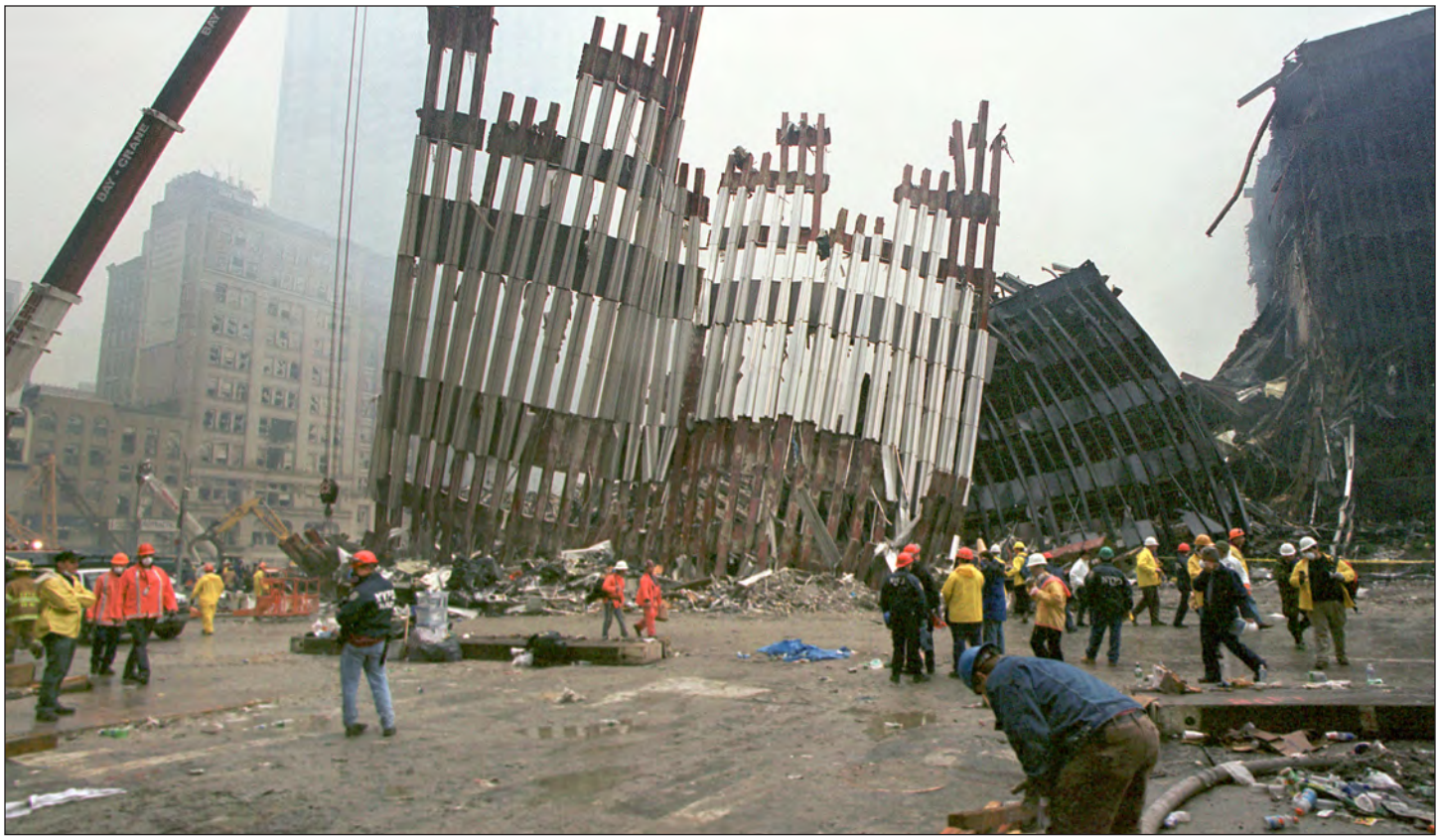
By 2008, it had begun to hand over responsibility of these activities to the DLA and ended the program by 2010. As with many other programs, once local units gained sufficient experience, the need for centralized expertise declined, and the center handed off its work to others. [11]

The Global War on Terror

At 8:46 a.m. on September 11, 2001, American Airlines Flight 11 out of Boston, Massachusetts, crashed into the north tower of the World Trade Center.

Another airliner, United Airlines Flight 175 from Boston, crashed into the south tower at 9:03 a.m., making it evident that the crashes were a coordinated attack.

Forty minutes after the second plane hit the World Trade Center, American Airlines Flight 77 crashed into the Pentagon at 9:43 a.m. It destroyed the first and second floor of the outer two rings of Wedge One and damaged a third ring and part of Wedge Two.



The 9/11 airplane terrorist attacks on the twin towers of the World Trade Center, the Pentagon and Somerset County killed 5,219 people and injured 8,786. It was the largest attack on American soil since Pearl Harbor, Hawaii, and which prompted a declaration of war three days later. ***(Photo by Master Sgt. Mark Olsen, New Jersey National Guard)***

Later investigations revealed that foreign terrorists belonging to a group called Al Qaida had hijacked the planes.

At 10:05 a.m., the south tower of the World Trade Center collapsed, followed by the north tower at 10:28.

Just after 10:00, United Airlines Flight 93 crashed in Somerset County, Pennsylvania. Terrorists had hijacked the plane, but passengers and crew forced it down before it could strike its target.

At 5:20 p.m., the 47-story Building Seven of the World Trade Center complex also collapsed due to collateral damage.

Including all four incidents, 5,219 people died and 8,786 were injured. It was the largest attack on American soil since the bombing of Pearl Harbor, Hawaii, in 1941.

On September 14, 2001, the president declared a national emergency, and Congress approved partial mobilization to get as many volunteers as possible to guard airports and other infrastructure.

For all practical purposes, the country was in a state of war, although actual declaration of hostilities against the nation where the attacks originated – Afghanistan – didn't come until October 7, followed by deployment of troops under Operation Enduring Freedom in January 2002 to remove al-Qaida and its supporters, known as the Taliban.

At roughly the same time, the president identified Iraq as a state sponsor of al-Qaida and other terrorists and pointed to intelligence suggesting Iraq was developing nuclear and chemical weapons.

As a result, Congress approved and Bush ordered the launch of Operation Iraqi Freedom March 19, 2003. These two operations together with other actions taken in response to terrorism fell under what became known as the Global War on Terror (GWOT). Although parts of the operations later ended, fighting continued in both nations into 2017. [12]

As operations proceeded, U.S. forces did not find chemical or nuclear agents, but they did find conventional stockpiles of up to a million tons of munitions, which posed a serious threat if they fell into the hands of terrorists or insurgents.

As U.S. Central Command (CENTCOM) Commander General John P. Abizaid told Congress, "There is more ammunition in Iraq than any place I've ever been in my life, and it is all not securable."

Thus, almost from the beginning, there was a need for disposal of ordnance in a nation the size of California. Through Task Force Bullet and other units, CENTCOM was able to destroy some 600,000 tons of ammunition over six months, but Combined Joint Task Force 7 found that processes and safety standards were inconsistent.

In June 2003, the task force requested the Huntsville Center's assistance in removing and eliminating ordnance under a Captured Enemy Ammunition (CEA) Program.

The center sent a three-man team to identify requirements and prepare a scope of work. The task force gave the center 120 days to assume cradle-to-grave management of munitions. The center received $285 million in initial funding for the mission August 8, 2003, and issued four contracts to known ordnance removal contractors. It would rebid the contracts in 2004. The funding would eventually grow to $1.5 billion. The center selected Parsons Infrastructure and Technology Group to provide logistical support to the mission.

Altogether, the center strength supporting the mission on the ground in Iraq grew to 25 personnel, including security and logistics managers.

The CEA program headquarters was at Camp Victory near Baghdad. Center personnel reported to the C-7 Engineers section of CENTCOM. In addition, 50 personnel in the Ordnance and Explosives Directorate in Huntsville provided ongoing support through contracting, technical guidance, and other forms of assistance.

Placed on a war footing, directorate personnel worked 24-hours-a-day, seven-days-a-week to support the mission. In addition, under Operation Restore Iraqi Oil, which the center also supported, personnel helped to clear Iraqi oil fields of unexploded ordnance to allow access to funding sources to support the interim government. [13]

The initial CEA mission involved destruction of ordnance at six consolidated weapons depots, which the center divided among three contractors. Tetra Tech-Foster Wheeler was responsible for depots at Al Najaf and Al Zubayr in southern Iraq; EOD Technologies operated at Taji and at a depot code-named Paladin in central Iraq; and USA-Environmental operated at depots code-named Arlington and Jaguar in northern Iraq.

Due to the small size of the demolition range at Taji, the center transferred operations to an Iraqi depot near Tikrit, renamed Buckmaster, in March 2004, and it replaced Al Zubayr with a depot at Al Ashraf.

When the center re-competed the contracts in 2004, Environmental Chemical Corporation and Zapata Engineering replaced EOD Technologies at Buckmaster and Paladin, respectively. There were roughly 200 U.S. contracted personnel at each site, which included logistical and security personnel, or about 2,400 altogether at the program's height, plus an additional 1,800 Iraqi contractors.

The task was very difficult because, as one participant noted, the stockpiles contained a "cornucopia of ammunition" from various countries dating back to the 1930s. Much of it was aging and unstable. Also, initially there were issues with obtaining enough fuel for operations and safety equipment for all contractors.

Only two years after the Gulf War began, EOD technicians working under the Huntsville Center's Coalition Munitions Clearance Program destroyed 217,000 tons of captured Iraqi munitions.
(U.S. Army photo)

EOD Technologies performed the first destruction of captured weapons September 11, 2003.

By December, the CEA program assumed management of all demolition in the country. By 2004, contractors had destroyed 217,000 tons of munitions. As destruction proceeded, the depots consolidated to two and then to one. USA-Environmental performed the last detonation of 246 tons at Arlington in 2006. By that time, the program had destroyed 400,000 tons of munitions altogether. [14]

There were several shifts or expansions of the mission as it proceeded. In 2004, the center shifted to supporting the Coalition Munitions Clearance (CMC) Program.

By this time, the insurgency in Iraq had become a distributed network of mostly foreign fighters using improvised explosive devices (IEDs) to attack U.S. troops on convoys. As U.S. forces patrolled villages, they often found caches of weapons or explosives being used to build IEDs.

To address this problem, the CMC established 20 mobile teams of contractors to clear any caches found. Over the course of three years, the program destroyed weapons at 51 clearance sites, typically consolidated caches of weapons found by military personnel. This was particularly dangerous work, and many

contractors fell victim to IEDs or roadside bombs while traveling to clearance sites.

By 2007, 43 contractors had died during the mission. To protect personnel, the center maintained one of the largest fleets of armored vehicles in the country. The program also allowed for heroics, as when a CMC convoy rescued stranded Marines in 2008.

In 2006, the CEA mission expanded to include training Iraqi personnel in depot operations. There was by this time only two legacy depots at Arlington and Buckmaster.

For two years, center contractors operated the two depots while training Iraqi personnel. The mission ended when the Iraqi army took over management of the last remaining depot at Arlington near Bayji September 29, 2008.

A final shift occurred in the mission when the CMC program reorganized to address inoperable munitions, which meant an end to the mobile mission.

At that time, CENTCOM renamed the program the Coalition Munitions Disposal (CMD) Program. In this program, contractors at a centralized collection point would dispose of unserviceable U.S. munitions as well as any additional weapons caches found. The center identified as the collection point a facility at the Besmaya Iraqi training base at Forward Operating Base Hammer.

In addition, the center continued to train Iraqi army personnel on explosives ordnance disposal (EOD). The Huntsville Center awarded the contract to EOD Technologies to support the CMD program in late 2008. Operations resumed on the program in January 2009. [15]

A similar situation was also developing in Afghanistan under Operation Enduring Freedom, but later and more slowly. More than 90 civilian employees deployed to Afghanistan to support the war effort over the decade following the beginning of U.S. operations in 2002, not including Reservists and National Guardsmen who also deployed. Many deployed multiple times.

While Afghanistan did not have the large stockpile of conventional weapons that Iraq had prior to the war, it also fell victim to a large number of IEDs and roadside bombs.

In May 2004, CENTCOM began negotiations for the MM CX to support clearance of large mined areas under the Enemy Munitions Assessments and Disposal program. Huntsville Center personnel and contractors began to deploy in July 2004 and disposal began in August.

Although the primary issue at first was clearing small mines and IEDs from all major airports, like in Iraq the program quickly spread to other areas. The center had a constant presence starting in that year, although mostly in an advisory role.

It was not until 2012 that a major contracted effort to dispose of Afghanistan stockpiles began under the Joint Munitions Disposal-Afghanistan program. [16]

Demilitarization Construction Advances

By 2008, construction of chemical weapon disposal plants using an incineration process under the Chemical Stockpile Disposal Program (CSDP) was far advanced. Incineration had been the preferred method of disposal since the early days of the program because of the speed and reliability of destruction, and so had gotten a head start over plants based on other technologies that required more research.

Operations at the Johnston Atoll Chemical Agent Disposal System, which accounted for 6 percent of the U.S. stockpile, were complete by 2000.

By November, so-called "sunset" construction had begun to handle elimination of the plant in an environmentally sensitive manner, including demolition, destruction of contaminated plant components, and treatment of soil.

For the most part, the Huntsville Center was not involved in decommissioning unless there were issues with facilities.

The next plant to become operational was the Tooele Chemical Disposal Facility, Utah, which went online in 1996. Operations at Tooele, which held the largest stockpile, continued past 2008. The contractor completed construction of the Anniston Chemical Disposal Facility, Alabama, in 2001. Full operations started in 2003, and by 2008 the facility had destroyed 317,670 nerve agent munitions, or roughly 46 percent of the stockpile at that location.

After pauses to modify the equipment to handle VX-filled land mines and then mustard gas, destruction of the weapons resumed.

The Umatilla Chemical Agent Disposal Facility was roughly a year behind Anniston. Construction had started in late 1997 for $567 million, of which the Huntsville Center managed $262 million. The contractor completed the facility in August 2001. However, destruction did not start until 2004 due to permitting issues.

By 2008, the plant had destroyed 1,255.66 tons of Sarin and VX gas and 155,000 shells, or roughly a third of the stockpile at that location.

While construction was ongoing at Umatilla, the Army awarded a $512 million contract to build an incineration facility at Pine Bluff, Arkansas, of which the Huntsville Center managed $206.5 million for construction and procurement. The contractor completed it in 2002, and the plant began operations in 2005.

In 2007, it had completed destruction of all Sarin gas rockets and after a pause to modify the plant, destruction of VX gas weapons began. [17]

In the National Defense Authorization Act of 1997 (PL

104-208), Congress required additional research into alternative methods of destruction and provided $40 million to build two pilot plants.

Despite the speed and reliability of incineration, many states questioned whether it released deadly pollutants into the atmosphere, and protests during the early days of the program were common at construction sites.

As required by Congress, the Army researched seven processes and found four viable: incineration; neutralization and supercritical water oxidation; neutralization, oxidation, and gas-phase chemical reduction; and electrochemical oxidation.

Instead of two, the Army ended up planning multiple plants using alternative methods since the remaining locations had much smaller stockpiles.

Pueblo Chemical Depot, Colorado, had the largest at 9.9 percent of the total U.S. stockpile (blister and mustard agents). Aberdeen Proving Ground, Maryland, had 5 percent (blister agents). Newport Army Ammunition Plant, Indiana, had 3.9 percent (VX); and Lexington-Blue Grass Army Depot, Kentucky, had 1.6 percent (VX, Sarin, and blister).

Of these, two sites – Newport and Aberdeen – contained agents in bulk containers with a single type of agent only, and two – Blue Grass and Pueblo – contained assembled chemical weapons and bulk agents of multiple types. [18]

The Huntsville Center finally progressed on construction of the neutralization plants with award of the construction contract for Aberdeen in 1998. Although these plants were to originally use a supercritical water oxidation process, following the 2001 terrorist attacks, Congress requested that the Army speed up destruction at the remaining plants.

Under Operation Speedy Neut, contractors redesigned the pilot plants at Aberdeen and Newport using an accelerated neutralization process using caustic hydrolysis, in which the agent was mixed with water and sodium hydroxide and heated. Because local treatment plants could not handle the resulting wastewater, the Army shipped the inert chemicals to Veolia Environmental Services, Port Arthur, Texas, for processing.

The contractor completed construction of the Aberdeen plant in 2002, operations began in 2003 and were complete by 2006, and the entire plant was demolished by 2007. It was a record, but the site contained only 5 percent of the U.S. stockpile.

The neutralization plant at Newport, Indiana, also proceeded.

The Army awarded the $295 million construction contract in 1999, the plant became operational in 2005 and had destroyed 1,269 tons of VX by 2008, and decommissioning was complete by 2009.

At Pine Bluff, an additional binary destruction facility was complete in 2006. This facility destroyed M687 rounds, which used a binary process that mixed two chemicals on delivery to form VX gas. The plant disassembled the rounds and drained and neutralized the chemicals separately for transportation and destruction in Texas.

The plants at two other sites – Blue Grass and Pueblo – were much slower in coming due to the experimental nature of their processes. At Blue Grass, the Army awarded a contract to design, build, operate, and decommission a plant using neutralization and supercritical water oxidation.

Construction began in 2006 before the design was complete, but funding limitations after 2008 pushed completion of the design to 2010 and construction to 2018.

At Pueblo, where the majority of stockpile was mustard gas, the Army awarded a contract to design a pilot plant using a neutralization and biotreatment process. The design was complete in 2007, but funding issues delayed construction. [19]

Funding and cost control remained the primary challenges with the CSDP.

After projected program costs had risen from $15 billion to $24 billion through the end of the program, the GAO had greatly criticized the program for its "long-standing and unresolved issues regarding its leadership, organization, and strategic planning."

To address these issues, the Department of Defense created the Chemical Materials Agency in 2003, and the Bush administration, which considered the chemical weapon stockpile a terrorist target, initially pushed for additional funding.

The Huntsville Center, which remained the lifecycle manager for the plants, also recognized the challenges of controlling cost and schedule growth, managing change orders, and meeting environmental requirements and took additional action to increase quality.

Although the GAO remained critical of the lack of a comprehensive strategy and the resulting funding issues, much of which was due to congressional decisions to pursue alternatives, no one could deny the progress made.

By 2006, the program had destroyed more than a third of all U.S. munitions; by 2007, it had destroyed more than half. Yet it became clear in 2006 that the U.S. would not meet its obligation under the 1997 Chemical Weapon Convention to complete destruction of all weapons by 2007, and it requested an extension through 2012. Most of the other parties to the convention had also requested extensions by this time.

Nevertheless, the U.S. had already destroyed more weapons than all of the other parties combined, which was due primarily to the center pushing ahead with construction of the disposal plants.

In 1998, a quarter of the CSDP budget – $225 million – went to the center to manage construction and procurement tasks, which amounted to 43.8 percent of its workload that year. As

contractors completed construction at Anniston, Umatilla, Pine Bluff, Aberdeen, and Newport, center funding also declined to $166 million or 18 percent of its workload by 2007. The remaining construction and decommissioning of the plants would continue at a lower level of funding. [20]

The Russian chemical weapon demilitarization program also made progress during this time. Like the U.S., Russia was a party to the Chemical Weapon Convention, which largely set the schedule for the Russian program. It scheduled destruction of 1 percent of Russian weapons by 2000 and 20 percent by 2002.

However, due primarily to funding issues, the Russian program had proceeded slowly, and Russia also requested an extension in the deadline for completing demilitarization.

Russia provided only about $140 million for all demilitarization (including nuclear) in 2003 and even less in 2004, amounting to a third of the budgetary requirements.

After the 2001 terrorist attacks, the destruction of Russian chemical stockpiles to prevent proliferation became a priority for President Bush, who urged increased funding to assist the Russians.

In 2003, the Defense Threat Reduction Agency, which had assumed responsibility for the Cooperative Threat Reduction program when it formed in 1998, had developed new and more aggressive plans to eliminate Russian chemical weapons.

Congress provided $450 million in funding in the 2003 Defense Appropriations Act (PL 107-248) for the program, although only $50 million went to chemical weapons, but it had also required in the National Defense Authorization Act of 2002 (PL 107-107) an annual Russian investment of $25 million, a practical disposal plan, laws requiring elimination of nerve agents at a single site, commitment to destroy two chemical weapon production facilities, and full disclosure about Russian stockpiles, which some believed were larger than Russia stated.

Congress did not release this funding until 2004 because of Russia not meeting these requirements. Thus, there were bureaucratic delays in both countries. [21] Despite these challenges, the Russian program made progress.

Construction of the Central Analytical Laboratory in Moscow, which had begun in 1996 under a Defense Nuclear Agency contract, came to a conclusion in 2001. This facility researched demilitarization methods to be used at the Russian facilities.

The Russian Chemical Weapons Destruction Facility at Shchuch'ye, meanwhile, faced major delays, despite efforts to consolidate responsibility for the program.

In 1998, HQUSACE replaced the Transatlantic Division with the Huntsville Center as the executive construction agent for the Russian Chemical Weapons Destruction Support Program, making the center responsible for ensuring completion of both design and construction of the destruction facility.

Mainly, the delay was due to political and geographic issues.

After the Huntsville Center issued the $888 million design and construction contract to Parsons in 1996, a subcontracted Russian firm completed engineering plans. However, preconstruction started slowly due to the isolated location of the plant on the edge of Siberia. The Moscow firm subcontracted to do the work had to build a concentration camp with warehouses and offices.

It took until 2004 before the Bush administration convinced Congress to release U.S. funds for construction despite Russia not meeting previously stated requirements. To help meet these requirements, the U.S. volunteered to assist Russia in dismantling weapons plants in 12 locations.

Once construction started, there were cultural issues with Russian views about product quality and safety that required greater U.S. involvement.

Even after completion of the buildings' exterior, there remained issues with Russia completing its portion of the buildings due to funding. Nevertheless, construction ended by 2008 and systemization and operational testing began.

In the meantime, Russia had proceeded with construction of additional destruction facilities on its own, including one at Gorny, which was complete in 2002, and another at Maradykovsky, which began operational testing in 2006. The latter was the location of 6,900 items or 17 percent of its stockpile. [22]

The Huntsville Center's work on the Russian chemical weapon demilitarization program also opened new doors to additional demilitarization work in former Soviet Union nations.

In early 2008, the Defense Threat Reduction Agency tasked the center to assist the nation of Azerbaijan in developing its own threat detection and response program. This involved construction of a Central Reference Laboratory in the city of Baku that was to serve as the hub of biological threat agent detection and response throughout the nation, in addition to studying and detecting pandemic disease such as the bird flu and swine fever.

"We want to ensure the government of Azerbaijan has a quality project and felt that providing construction management support would benefit both sides," said Shawn Cali, the Biological Thread Reduction program manager. "To do so we felt that a government representative would be best and based on past CTR work with the Corps, it was recommended that we use Huntsville."

Center personnel met with Azerbaijan officials throughout the year to scope out the project. In short, although the CSDP program was by then beginning to decline, there was promise of additional work for the Huntsville Center in this business line. [23]

Resurgence of Ballistic Missile Defense

After 1998, the William J. Clinton administration finally started to proceed with the National Missile Defense (NMD) program, primarily as a defense against rogue nuclear launches.

That year, the Ballistic Missile Defense Organization (BMDO) selected the Boeing Corporation as the lead systems integrator. The BMDO chose a Boeing rocket as the primary booster of the interceptor missile.

In December 1998, NMD program manager Maj. Gen. William B. Nance signed a charter with Maj. Gen. Milton Hunter of the Corps pledging Corps support to the NMD program and recognizing the Huntsville Center as a full partner in overseeing design and construction of all facilities. The center would directly support construction in Alaska and North Dakota.

On Meck Island and Kwajalein Atoll, the Honolulu District managed construction of test missile silos installed by 2000, but the Huntsville Center managed design and provided oversight of the entire project. After pledges from the administration in support of the NMD program, Congress also demonstrated its commitment to the program through the passage of the 1999 Missile Defense Act (PL 106-38).

This act established the policy to deploy an NMD system capable of defending the U.S. from a limited ballistic missile strike "as soon as it is technologically possible."

At the same time, it encouraged continued negotiations with Russia to change the anti-ballistic missile treaty under the Strategic Arms Limitations Talks (SALT) treaty. However, despite congressional encouragement and despite his promises and initial activity, Clinton announced September 1, 2000, that he would not deploy the NMD system but leave this decision for the next president to be elected later that year. [24]

From the moment President George W. Bush entered office, he made clear that he would seek to deploy the NMD system.

Almost immediately, he sought funding increases for NMD from $4.5 billion to $7.8 billion, mostly for new equipment. Only a fraction of these funds – $13 million – went to the Huntsville Center in 2001, but the center provided a disproportionate percent of labor – 10 percent – for the amount of funding. Its funding peaked in 2002 at $31 million or roughly 4 percent of its overall budget.

With the terrorist attacks of September 11, 2001, the amount of funding for NMD increased even more, reaching $55 billion by 2004.

There were broad fears that terrorist groups would obtain missile technology from so-called rogue nations, including what Bush called the "axis of evil": Iran and North Korea. By the end of 2001, the Bush administration had selected an additional site for deployment of missiles, pushing against the SALT anti-ballistic missile (ABM) limitations.

On December 14, 2001, the administration announced it would withdraw from the ABM treaty in six months, saying it was a relic of a "much different time, in a vastly different world" that prevented Bush from protecting the American people against rogue launches.

Although Democrats in Congress and Russian President Vladimir Putin criticized the move, there was little protest overall. At the same time, the Department of Defense reorganized BMDO as the Missile Defense Agency (MDA). In December 2002, National Security Policy Directive (NSPD) 23 directed deployment of a BMD system starting in 2004. [25]

In 2001, the Bush administration selected Fort Greely, Alaska, as a second NMD site in addition to the existing site at Grand Forks, North Dakota, formerly the sole SAFEGUARD location.

Fort Greely on Kodiak Island had been a World War II airfield named after famed Arctic explorer Maj. Gen. Adolphus Greely and had actually been on the BRAC list for realignment as a substation of Fort Richardson until re-tasked by Bush.

Termed a "test bed" until the U.S. withdrew from the ABM treaty, the site would house 16 interceptor missiles to protect the avenue approach from North Korea. The Huntsville Center completed design of the initial silos and managed a $9 million contract to clear the base for use, and the Alaska District managed construction. The design included steel construction and insulated pipes due to permafrost. The contractor completed construction of the facilities by 2004, when the interceptor missiles arrived for installation.

Almost immediately after completion of the initial facilities, the center began work on a capability enhancement to expand or improve the facilities. For example, the center designed and contractors installed a high-altitude electromagnetic pulse (HEMP)-resistant power plant in 2005. The center added an expanded electronic security system with a new entry control point at a second missile field the same year. These changes, amounting to more than $10 million, were complete by the end of 2006.

In 2006, the center started design of the Defense Satellite Communication System expansion to accommodate a second Ground-Based Radar or "radome." [26]

A second site where the MDA deployed interceptors was Vandenberg Air Force Base, California.

The Department of Defense had decided in 2002 to deploy four interceptors in California by 2005. At first, the rationale for this decision was to provide greater realism to the test bed, since interceptors from multiple sites would take out a ballistic missile. However, the site would then become part of the overall BMD system deployed to protect all 50 states.

The Huntsville Center oversaw rehabilitation of the site and designed modification of existing buildings at Vandenberg, which already had existing missile silos. The center awarded a contract to remove outdated structures and buildings in February 2004, and the Los Angeles District managed construction of a security

center, four launch facilities, storage igloos, and an administration building in 2004 and 2005.

Because many facilities already existed and merely needed reconfiguration, the project was much lower cost than that in Alaska.

In any case, with completion of the work at Vandenberg, the Huntsville Center's NMD budget rapidly declined, dropping from $23.5 million in 2006 or slightly more than 2 percent of its budget to less than 1 percent in 2007.

As a result of this decline and anticipated low activity over the next years, the center eliminated the BMD Directorate, moving it under the Installation Support Directorate.

The former director of BMD, John Matthews, continued to serve as the new Deputy for Program and Technical Management until becoming director of programs in 2008. [27]

Installation Support

On October 29, 2001, partly in response to the September 11 terrorist attacks and partly in response to the 2001 Quadrennial Defense Review report, which identified new risks to the U.S. military, Secretary of Defense Donald Rumsfeld established the Office of Force Transformation.

Its purpose was to implement Defense Transformation, of which Army Transformation was a subset. There was wide recognition after 9-11 that the military needed to move away from Cold War organizations, processes, and modes of thinking to meet the asymmetrical threat of global terrorism.

In addition to leveraging new technologies, Transformation also entailed adoption of new organizations, such as brigade combat teams, which combined under a single command elements previously organized in stove-piped units divided by branch or function.

One such new organization was the Installation Management Agency (IMA), which the Army established in 2002. Prior to this time, management of installations fell to major base tenants, which varied from base to base.

The IMA, which became the Installation Management Command (IMCOM) in 2005, united base management under a single organization. This ensured greater consistency and standardization across all Army bases.

As early as 1999, HQUSACE had reorganized its Military Programs Directorate to include an Installation Support Division and assigned the Huntsville Center to serve Army installation support activities.

In 2002, HQUSACE named the center as Directory of Expertise for Heating, Ventilation, and Air Conditioning (HVAC), and in 2005 Directory of Expertise for Facility Systems Safety.

A directory of expertise maintained a listing of personnel in the Corps with expertise in a specific area and was later converted to a technical center of expertise.

As the installation support mission grew under the IMA and IMCOM, HQUSACE assigned the center as the Installation Support Center of Expertise (IS CX) in 2007.

The Huntsville Center in turn created an Installation Support and Programs Management Directorate. This was the fastest growing business area in the center and included a broad range of programs, including facilities repair and reduction, furnishings, range and training, energy conservation, electronic security, and medical repair and renewal.

IMCOM praised the resulting support. From 2005 to 2008, Military Integration Division Manager Mark Fleming won the IMCOM Support Professional of the Year award for three straight years. [28]

The Huntsville Center had continued to support the Operation and Maintenance Engineering Enhancement (OMEE) and Military Construction standardization programs as it had over the previous decade.

Both programs expanded considerably under IMCOM. Although the OMEE program focused initially on medical facilities, it had expanded by 1998 to other facilities.

This now included Corps dams and reservoirs such as Blakely Mountain Power Plant at Lake Ouchita, Arkansas; Leland Bowman Lock, Louisiana; and Lock and Dam 15 at Rock Island, Illinois. The Facilities Repair and Renewal Program, formerly part of the Maintenance, Repair, and Renovation Program, had expanded to include Department of Homeland Security facilities, with including a $2 million upgrade of the Immigration and Customs Enforcement Service Processing Center at Aguadilla, Puerto Rico. One of its largest projects was a $35-40 million repair of the Michoud Assembly Plant, Louisiana, damaged by Hurricane Katrina.

The Center also continued to serve as the standardization center for 16 facility types, including designs for child development centers, physical fitness centers, fire stations, and training ranges.

There were two major developments in the program.

One was the use of building information management (BIM) systems. Similar to GIS, BIM linked building maps, drawings, and 3-D models with other data for structures, mechanical, and electronics that designers, builders, and maintainers could use to manage a facility. Trials showed that BIM could shorten the design phase by 50 percent by identifying unanticipated changes associated with construction.

A second major development was involvement in construction of standardized facilities. Previously, the center had been involved only in preparing standardized designs.

In 2006, the Department of Defense established the Military Construction Transformation program to complete construction projects 30 percent faster and 15 percent cheaper using the standardized designs. The centers of standardization were responsible for awarding construction contracts, which local districts administered.

IMCOM expected funding for the program to reach $50 billion. One of the first projects completed under the program was construction of the Smith Fitness Center at Fort Benning, Georgia, completed in June 2007. Another project involved an $8.6 million child development center at Fort Campbell, Kentucky.

In 2008, the Center issued a $7.6 million contract to build 30 standardized child care centers, the first of several contracts going forward. [29]

The Huntsville Center continued to support procurement and delivery of standard and modular furniture components under the Army Barracks Renewal Program, which quickly outpaced the center's work for the Army Reserve.

In 1999, to increase ordering efficiency, the center worked with the General Services Administration (GSA) to develop standard furniture and design of spaces involving multiple pieces of furniture for Unaccompanied Personnel Housing (barracks), which it issued that year in new specifications.

The standard was so popular the GSA adopted it in 2001 for use on special order program contracts. Work included such projects as providing furniture for barracks at Fort Stewart, Georgia, in 2004.

In 2006 alone, the center provided 32,436 living spaces, including 4,500 critical replacement furnishings, for $14 million.

Because of the continued success of the program and the dramatic cost savings from ordering furniture in bulk, in 2006 the Office of Assistant Chief of Staff for Installation Management designated the center as manager of the Centrally Managed Administrative Furniture Program.

Buying products in bulk also allowed the center to recommend changes in designs to meet the specialized needs of Soldiers. In this program, IMCOM purchased furniture directly through the center rather than each installation being responsible for its own furnishings.

The following year, the center procured furniture under the Centrally Managed Administrative Furniture Program, in addition to procuring $2.4 million in other furnishings for the Warriors in Transition program. [30]

After 2001, there was a major resurgence in the Army Range and Training Land Program, which the Huntsville Center had supported since 1981. This resurgence was largely due to the growth of the military and installation budgets after the September 11 terrorist attacks.

In 1997, the Aviation and Missile Command (AMCOM) requested support from the Corps to develop military operations in urban terrain (MOUT) ranges for aviation units.

Partnering with the Louisville District, the center designed a range at Fort Knox, Kentucky, incorporating mechanized vehicles and special effects with a wide range of building types. For its work on a MOUT range at Fort Knox, Kentucky, the team won a National Engineering Excellence Award from the American Consulting Engineer Council.

The center also supported development of the Army's largest MOUT complex at Fort Irwin, California, which included 232 buildings. The contractor completed the first phase of construction in 2007 for $12 million.

From 2002 to 2007, the center worked with the Alaska and Honolulu districts to update ranges for use by new Stryker battalions at Fort Richardson, Alaska; and Schofield Barracks, Hawaii. Such projects were in addition to offering a range design course.

In 2006, the center awarded a $29 million contract for readiness support services to support range projects. By the end of 2007, the center had supported more than 285 range modernization projects worldwide since the origin of the program. [31]

A major new installation program involved the reduction of installation building space. Defense Reform Initiative Directive (DRID) 11 of 1997 had established a board to review space management in the Department of Defense with an eye to reduce energy use and construction and maintenance costs.

In 2004, the department established the Facilities Reduction Program to eliminate 132 million square feet of excess space through demolition, renovation, or relocation. To meet this goal, the Assistant Chief of Staff for Installation Management required a 50 percent reduction in construction managerial and a one-for-one replacement of space added.

The Huntsville Center supported the program and issued bulletins with guidance for deconstruction, solid waste diversion, and other issues. It was able to achieve considerable reduction through the demolition of temporary buildings at Fort Myer, Virginia; Fort Hamilton, New York; and Fort Polk, Louisiana.

At the latter, the center was able to eliminate 294,148 square feet of buildings. The program was so successful the center issued a demolition services contract in December 2007 to support additional deconstruction.

Some projects were more complicated because demolition had to meet foreign regulations, such as removal of facilities at Katterbach, Germany, in 2008, or because they involved hazardous materials, such as demolition of the chemical demilitarization facilities at Tooele starting May 29, 2008.

The center also obtained additional space through relocation

of facilities. In 2006, the center coordinated an auction to relocate facilities at Fort Huachuca, Arizona.

Altogether, the center was able to achieve significant space reductions. It eliminated 613 buildings in 2006 alone, which resulted in $7.3 million in savings through 2007. [32]

Several other long-running programs fell under the IS CX. One was the Electronic Security Systems Center of Expertise. The security program had more than tripled from $8 million to $26 million from 1998 to 2000, and the team grew to more than 10 personnel.

Major projects included providing security at the Smithsonian Institution in Washington, D.C., which, at $15 million, was the largest ESS effort prior to 2001, as well as installation of security systems at all Bureau of Reclamation dams west of the Mississippi River.

The 9/11 attack caused the Army to relook at its Access Control Points. In response, the Huntsville Center designed new ACPs and supported surveillance and security facilities as well.
(Photo courtesy of Huntsville Center Historical Archives)

After the September 11, 2001, attacks, however, growth in the program accelerated even more. Between 2001 and 2007, the center completed $390 million in projects.

Other major customers included the Bureau of Land Management, Immigration and Naturalization Service, Federal Bureau of Investigation, Bureau of Engraving and Printing, Centers for Disease Control and Prevention, Kennedy Center for Performing Arts, and the National Weather Service. Its work by this time included all 50 states and at federal facilities or military installations in Europe and Asia. [33]

After 9/11, the Headquarters of the Department of the Army directed all installations to adopt closed-post security measures.

In response, the Huntsville Center developed the Access Control Point and Access Control Point Equipment programs.

Under the Access Control Point Program, the center helped design new access control points and gates entering installations as well as supporting surveillance and security facilities. Some of these designs could be very elegant – in 2008, the center won the Leadership in Energy and Environmental Design Award for the $2.7 million Fort Bragg, North Carolina, Community Emergency Services facility.

Under the Access Control Point Equipment Program, the center procured and installed security equipment. This generally included three phases: purchasing and dropping equipment, completing surveys and reports, and installing equipment procured.

By 2004, the center had purchased $360 million in equipment for installation, $162 million that year. Of this, $79 million purchased 4,100 new pieces of equipment. Also by 2004, the center had completed 221 site surveys and had installed 2,100 pieces of security equipment.

A third program was the Automated Installation Entry Program, which combined the best of the Access Control Point and Equipment programs by providing automated systems to process vehicles onto an installation with minimal human interaction.

Even as it started pilot projects at Letterkenny Army Depot, Pennsylvania, and Fort Carson, Colorado, the center started its first major project in 2008 on Redstone Arsenal, Alabama, for $1.7 million. The project, which was scheduled for completion in 2010, could save up to $6 million annually in reduced security personnel salaries. [34]

The Huntsville Center's energy programs also fell under the IS CX. In 1999, Executive Order 13123 set new standards for federal government energy management and established stricter consumption controls. Despite these efforts, energy use skyrocketed after 2001 with the growth of the active military.

Just in 2006, the Department of Defense spent $3.5 billion on energy, the most in the U.S. government. Twenty-two percent of that usage came from buildings and facilities.

The Energy Policy Act of 2005 (PL 109-58) established a goal of achieving a 20 percent reduction in energy consumption in the federal government by 2015 and directed all federal agencies to meter their energy use.

Executive Order 13423 of 2007 reiterated these mandates by requiring a 30 percent reduction in energy use by 2015, a 16 percent reduction in water use, a 15 percent reduction in capital inventory, and a 2 percent annual reduction in petroleum, as well as demanding greater use of renewable energy, recycled materials, and reduction of hazardous and toxic wastes. [35]

The center's energy programs greatly benefited from these measures. Energy Savings Performance Contracts (ESPC) took off from 1997 to 1999, increasing from $13 million to $104 million, due to 18 contract solicitations.

By 2007, the center had awarded $238 million in ESPC contracts at 22 installations. Among these were a $12 million barracks HVAC at Fort Bragg; a $30-million steam plant at Tobyhanna Army Depot, Pennsylvania; a central power plant

and gas pipeline at the U.S. Military Academy, New York; and $27.5 million in gas-fired heating plants in 237 buildings at Fort Richardson, Alaska. Such contracts reduced both energy use and pollution by using environmentally-friendly technology.

The center pioneered other contracting methods. The Utility Monitoring Control Systems (UMCS) Center of Expertise experimented with what later became known as a multiple award task order contract.

In 1998, the center issued a $150 million indefinite delivery/ indefinite quantity (IDIQ) contract to three pre-approved contractors, who would bid on task orders. This resulted in faster awards, and use of the contract tripled after the first year.

By 2008, the center had issued $300 million in UMCS contracts. The largest project was the renovation of the Pentagon, which ran from 1996 to 2007. The Building Operation Command Center installed as part of this project helped manage alarm and security systems during the response to the September 11, 2001, terrorist attacks.

The center continued to develop contracting methods to privatize utilities in response to DRID 9 and entered into its first such contract at Fort A.P. Hill, Virginia, in 1998. The base completed privatization in 2002. It issued two more contracts in 2000 for Fort Bragg and Fort Campbell. Although the center had not seen major activity in a decade in the Energy Engineering Analysis Program (EEAP), through which installations took numerous small conservation measures, the program saw a revival after 2005.

In 2005, a study at Fort Polk, Louisiana, identified 248 conservation actions with an estimated savings of $3.6 million annually and an energy savings of 26.2 percent.

A similar study at Rock Island Arsenal, Illinois, identified savings of $21.8 million and 25 percent reduction in energy.

The center conducted several projects under the repair and renewal program, including replacement of a power plant at Fort Wainwright, Alaska, in 2006. In 2008, the center issued three IDIQ contracts for $276 million to support ongoing energy replacement efforts. [36]

The Huntsville Center supported several new energy programs after 2001. In the Utility Systems Surveys Program, the center surveyed base utility systems to identify possible savings.

During the first two years of the program (2004 to 2006), the center analyzed 42 installations and identified $12.7 million in savings through demand-side management or energy control systems.

Eventually, under the Resource Efficiency Manager (REM) Program, center contractors would assist installations on an ongoing basis.

The newest energy program was the Army Metering Program. Since the 2005 Energy Policy Act required metering and analysis of energy use at all federal facilities, IMCOM established and funded this program starting in 2006 to replace meters to identify consumption reduction opportunities. The Department of Defense authorized all facilities with energy use of $35,000 per year or more – more than 6,700 facilities at 480 sites worldwide – as eligible to receive new advanced meters, which allowed centralized management through the Internet.

The Army anticipated installation of more than 13,000 meters for electricity, water, or gas. The center developed a management plan for the program in 2007.

During 2008, the center used $23 million in funding to install advanced electrical and natural-gas meters at 22 military installations. Despite the cost, the center identified $26 million in savings based on more accurate meter readings across five states. [37]

The medical support program, which also fell under installation support, greatly expanded after 1998.

Since 1977, HQUSACE had supported design of medical facilities through a Medical Facilities Design Office. It had established the office after a Department of Defense study, *Comparative Health Facility Acquisition Methodology Study*, recommended centralization of medical facility design to achieve greater cost savings.

With growth in medical contracting at the Huntsville Center, HQUSACE moved the office and its 14 employees to Huntsville in 1999, which it renamed the Medical Facilities Mandatory Center of Expertise and Standardization.

"DoD's medical program has no geographic boundaries, so the Huntsville Center is the appropriate place for it organizationally," CX Chief Thomas Kenny said.

In 2007, the center of expertise moved under the Engineering Directorate. The center of expertise provided lifecycle support of all medical construction programs ($67 million annually), but local districts executed contracts under center oversight once 35 percent complete. Most new work under the center of expertise was oversight of new hospital construction.

The first major new project was at the Fort Belvoir Community Hospital, Virginia; the Norfolk District awarded and executed a $649 million contract under Huntsville Center oversight. Another major contract was for the $215 million Basset Army Community Hospital at Fort Wainwright, Alaska, which was particularly challenging because of building on partially frozen ground.

By 2008, the center of expertise had supported 425 medical facility projects worth $10 billion including the work previously conducted at HQUSACE; it completed $2 billion worth of work in 2008 alone. That year, the center awarded four contracts worth $388 million to support ongoing medical construction projects. [38]

The Huntsville Center also continued to support long-running medical procurement and contracting programs. A major

program remained the Medical Repair and Renewal Program for the Medical Command (MEDCOM) and the Department of Veterans Affairs.

By 2007, the program grew to 106 projects for $432 million. The most notable projects during this time were a $15 million renovation of Walter Reed Medical Center, Maryland; and a $4.9 million project at Little Rock Air Force Base, Arkansas.

However, the center completed similar projects at Keesler Air Force Base, Mississippi; Lackland Air Force Base, Texas; and other bases. The OMEE program for medical facilities had also continued to grow as the center provided operational support for medical facilities.

Through 2007, the center awarded two IDIQ contracts and five small business contracts valued at $375 million to assist medical facilities in developing operational guides.

In the Integrated Modular Medical Support Program, the center continued to procure medical equipment, such as sterilizers and medical imaging systems.

In 2005, the center issued a $50 million contract to deliver modular equipment. By 2007, it was looking to expand the program by adding furniture to the available equipment to procure. The same year, it began procuring equipment for the Walter Reed renovation, one of the largest procurements in the program. [39]

As the Huntsville Center entered into its fifth decade in existence, and its second decade as an engineering support center, it had greatly evolved as it continued to mature and grow. This was in large measure due to the efforts and technical expertise of its people.

"Huntsville Center is the Corps of Engineers' crown jewel," wrote Colonel Rivenburgh, who served as center commander from August 2003 to July 2006. "You all do so much with little or no recognition. It seems like every hard job the Corps has ends up in Huntsville and you always respond like one would expect out of professionals like you."

He had once defined four ways the center delivered expertise to the Corps: through projects critical to national security such as missile defense; through individual projects supporting installations such as ordnance removal, energy conservation, and range design; as resource providers through medical and energy procurement; and as centers of expertise, of which the center maintained 14 supporting the Corps community.

Yet the identity and business lines of the center would continue to evolve as the next generation of employees brought new vision, focus, and missions. [40]

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8

National Solutions, 2008-2017

In one of his final notes as the 52nd Chief of Engineers, Lt. Gen. Robert L. Van Antwerp sent his annual Earth Day message on April 22, 2011.

In it, he discussed the role of the U.S. Army Corps of Engineers as environmental "solutioneers."

He wrote, "As not only the Nation's engineers, but the Nation's environmental engineers, we are evaluating how the Corps of Engineers will function today and deep into the 21st Century. That means we must be part of the Nation's solutions through smart leadership and ground-breaking engineering."

He discussed a three-legged stool supporting the Corps mission: environmental work, sustainability, and energy reduction. It was no accident that these were the areas where the U.S. Army Engineering and Support Center, Huntsville, had been leading for more than 40 years.

As a support center, Huntsville long provided leadership and assistance in the central missions of the Corps.

The Environmental and Munitions Center of Expertise (EM CX), an area where the center had led since 1978, remained one of the largest business lines in the center.

The Installation Support Center of Expertise (IS CX), which was the largest business area in the center, addressed sustainability by reducing the Army's facility footprint while supporting diverse areas ranging from procurement and electronic security to maintenance and repair.

In the area of energy reduction, which grew dramatically after 2008, the Huntsville Center maintained several centers of expertise, including Utility Monitoring and Control Systems and Energy Savings Performance Contracts.

The center also continued to support "the security of our nation" through ballistic missile defense, its original mission. The chemical demilitarization program, which secured the world against the most environmentally dangerous weapons, was concluding its work and was, by 2016, no longer a major program at the center for the first time in 30 years. It had shifted to new growth areas and expanded mission sets. [1]

The emphasis on environment, sustainability, and energy reduction reflected the political realities after 2008. With the inauguration of President Barack H. Obama, the federal government increasingly stressed greater defense budget reductions, stricter environmental standards, and increased focus on renewable energy – continual sources of energy such as solar radiation or wind farms rather than expendable sources such as natural gas or oil.

Part of the Army's effort to reduce its facility footprint, the Corps of Engineers began tearing down outdated buildings such as this 40-year-old housing complex at Fort Myer, Virginia.
(Photo by Debra Valine)

The American Reinvestment and Recovery Act (ARRA) of 2009 (PL 111-5) provided funding for so-called "shovel-ready" projects to help stimulate economic activity; many of the projects selected involved alternative energy projects, and the Corps received considerable funds to jump-start renewable projects as well as renovation and repair programs.

At the same time, the Budget Control Act of 2011 (PL 112-25) introduced severe cuts in the defense budget. The act required budget cuts of a trillion dollars over nine years and established a "super committee" to work out the details; however, it also established mandatory spending caps – "sequestration" – if the committee could not reach agreement by 2013.

Each year, the Office of Management and Budget would "sequester" budget items worth $109 billion, split evenly between Defense and non-mandatory, non-Defense budget items.

The annual $55 billion defense cuts resulted in a series of troop reductions, although the last round of Base Realignment and Closure (BRAC) was in 2005. This was despite continued support of overseas contingency operations.

Solar arrays, such as this one on Biggs Field at Fort Bliss, Texas, are part of the Army's initiative to reduce its dependence on fossil fuels. (U.S. Army photo)

Given the reductions, the Army had to reduce operating costs and extend the life of facilities through improved sustainability.

Meanwhile, the Obama administration also passed stricter environmental regulations, which also impacted installations.

In 2016, the U.S. became a signatory of the United Nations Framework Convention on Climate Change or Paris Accords requiring dramatic reductions on carbon emissions. Although the Senate had not ratified the treaty, the president was already working to meet its requirements. The combination of these three produced a push and pull rationale for increasing the efficiency of military installations while decreasing their footprint. [2]

Environmental and Munitions Mandatory Center of Expertise

The first leg of the stool supporting the overall Corps mission was the Huntsville Center's ongoing environmental and ordnance missions.

The Huntsville Center had supported multiple environmental missions since 1978 under the Army Pollution Abatement Program and then the Defense Environmental Restoration Program. In 1986, the Environmental Protection Agency (EPA) turned to the Corps to provide design and construction oversight of hazardous waste cleanup under the Superfund Program.

Originally, the Omaha and Kansas City districts performed most work. However, as the years progressed, the Headquarters of the U.S. Army Corps of Engineers (HQUSACE) decentralized execution of the environmental work.

In 1990, it established the Ordnance and Explosive Waste Mandatory Center of Expertise and Design Center under the Huntsville Division to support munitions-related remediation and in 1991 designated and stood up the Hazardous, Toxic, and Radioactive Waste Mandatory Center of Expertise in Omaha, Nebraska, then under the Missouri River Division.

To create synergy to support the nationwide environmental missions, HQUSACE then merged these two centers of expertise in 2007 to form the EM CX under the Huntsville Center. The EM CX comprised approximately 70 staff members with expertise in environmental compliance, cost engineering, geo-environmental and process engineering, chemistry, geophysics, geology, toxicology, environmental health and safety, munitions safety, health physics, explosive safety, risk management and communications, environmental law, and contracting.

By 2016, the EM CX included five divisions: Environmental Management and Cost, Environmental Regulatory Compliance, Environmental Engineering and Geology, Environmental Sciences, and Military Munitions. The director and four of the five divisions are physically located in Omaha, and the fifth, the Military Munitions Division, is in Huntsville.

The EM CX was not an execution organization; it was a mandatory center of expertise whose primary missions focused on five broad areas: quality assurance, BRAC support, technical support, guidance development, training, and programmatic support to Corps offices worldwide. [3]

A major responsibility of the EM CX was quality assurance of environmental and munitions sites. The EM CX conducted quality assurance reviews, environmental lab audits and data reviews, regulatory compliance audits, munitions safety submission reviews, field oversight and troubleshooting, accident investigations, and review of all Military Munitions Response Program (MMRP) explosive and chemical safety submissions.

As part of this responsibility, the EM CX reviewed 9,235

documents, and its Quality Assurance Oversight Team assessed 30 laboratories since 2007. Quality assurance often resulted in major cost-savings as the EM CX found more cost-effective and justifiable strategies for environmental remediation projects while working with local districts. Since November 2007, the quality assurance effort resulted in an average implemented value-added savings to Corps projects of $15.7 million per year.

For example, on the Camp Haan, California, Formerly Used Defense Site (FUDS) project, the EM CX demonstrated the initial risk assessment approach was flawed and no feasibility study or remedial action was necessary, resulting in $6.5 million in cost savings.

For the Colonie, New York, Formerly Used Sites Remedial Action Program (FUSRAP) site, the EM CX encouraged the New York District to use a risk-based approach for addressing uranium dust in homes, resulting in a proposed plan that recommended a No Further Action findings, saving $1.5 million in remediation costs.

For the Fort Barry, California, Rifle and Pistol Range FUDS project, the EM CX identified a serious flaw in the studies and was able to make a convincing argument that the lowest cost alternative was possible, resulting in it being chosen as the preferred alternative at a cost savings of $11.5 million. [4]

A new area of responsibility began in 2007, when the Army BRAC Office requested the EM CX to provide a grants officer, program management and legal support pertaining to the Environmental Services Cooperative Agreements (ESCA) Program. This program created a grant mechanism that enabled the Army to provide cleanup funding to a local governmental entity, such as a reuse authority, to conduct all remedial activities necessary to meet state and federal cleanup standards more efficiently than traditional contracts.

The EM CX supported 11 ESCAs and eight federal facilities with cleanup costs approaching $500 million. The majority of the ESCAs were multi-year cleanup requirements with some lasting 20-30 years. [5]

The EM CX provided technical support to HQUSACE and Corps offices worldwide on complex environmental and munitions issues. Its experts provided independent technical reviews, technical project planning facilitation, long-term monitoring optimization, remediation systems evaluations, discipline-specific technical support, value-engineering study determinations, cost-to-complete estimates, and environmental management systems reviews.

Lt. Col. David Bailey
June 2009 - July 2009

Col. Nello Tortora
July 2009 - July 2012

The EM CX provided technical support to the districts on a number of major efforts, including the Comprehensive Everglades Restoration Plan, cleanup and closure of the Environmental Chemistry Laboratory for the U.S. Army Engineer Research Development Center (ERDC), and source selection for the $3.7 billion Total Environmental Restoration Contracts for the Omaha, Kansas City, Baltimore, Louisville, Tulsa, Alaska and Savannah districts.

In addition, there were many areas of innovation within the EM CX. In the Military Munitions Innovative Technology Program, the EM CX led adoption of Advanced Geophysical Classification, which became the industry standard and led to potential savings of $1 billion to $2 billion in the MMRP.

In December 2016, Chuck Coyle, a process engineer at the EM CX, was party to a patent award for a cost-effective environmental treatment process that allows for in situ remediation of vadose zone soils applicable to pollutants such as TNT and RDX. [6]

Since 1995, the EM CX and its precursors had been involved in regulatory compliance and guidance. The center developed 153 original guidance documents, including engineer regulations, manuals, pamphlets, design guides and guide specifications, and it developed an additional 24 updates to the original documents.

For example, the EM CX provided input to the DERP Manual 4715.20; the Engineer Manual 200-1-4, *Risk Assessment Handbook*; Engineer Manual 200-1-15, *Technical Guidance for Military Munitions Response Actions*; and Engineer Regulation 385-1-92, *The USACE Safety and Health Requirements Manual.*

A major effort involved combining the majority of explosives safety documents into Engineer Manual 385-1-97, which reduced project review and approval from six months to less than two months.

In addition, the EM CX supported the efforts of greening the government and provided technical support to ensure compliance with Executive Order 13148, which required 10 percent annual reduction in release of toxic substances, and Executive Order 13423, which required increased use of recycled materials and reduction of energy use on behalf of the Corps Civil Works mission.

Under the FUSRAP Program, the CX researched, investigated, devised policy and guidance, and assisted districts with contracting to expand disposal of radioactive material by determining that there were additional alternate legal and regulatory options available for disposal of soils, with potential

savings of $100 million across the federal government.

This effort required coordination with and obtaining concurrence from the EPA, Department of Energy, Congress, Department of Justice, and other agencies.

Another major responsibility of the EM CX was development and instruction of Proponent-Sponsored Engineer Corps Training (PROSPECT) courses as well as informal training.

Col. Robert J. Ruch
July 2012 - May 2016

The EM CX developed and taught 11 different PROSPECT courses with multiple sessions each year for a combined total of 170 courses and more than 3,296 students trained since 2007. It also conducted 29 initial Hazardous Waste Initial Manifesting courses to 543 students and 71 Hazardous Waste Manifesting Recertification courses to 1,120 students.

In additional, the EM CX developed an Environmental Training Courses for the Army National Guard and a FUDS Training Program. The FUDS program included up to 52 different classroom or webinar courses. Training was increasingly available online for most areas. These efforts helped the EM CX to ensure the districts had the technical resources and trained personnel they needed to execute their environmental missions. [8]

The EM CX actively supported numerous programs, including the Superfund Program, the Superfund Cost Recovery Program, the Installation Restoration Program, FUDS, MMRP, FUSRAP, the BRAC Programs, the Corps Civil Works Compliance Program, and the Deactivated Nuclear Reactor Program.

Activities ranged from performing five-year reviews required under the Comprehensive Environmental Response, Compensation, and Liability Act and assisting customers with Potentially Responsible Party investigations, to serving as the Corps Radiation Safety Officer and serving as the Environmental Support Team liaison on behalf of HQUSACE.

The EM CX also provided assistance to HQUSACE with special studies and analyses as requested. Since 2004, the CX was responsible for completing initial MMRP site inspections of all FUDS sites to determine safety and need for additional study.

Through 2013, the CX completed 959 site investigations on 927 properties that addressed more than 1,700 munitions response sites and more than 200 potential areas of interest. Starting in 2010, the EM CX helped implement the DERP Environmental Laboratory Accreditation Program and maintained a directory of 100 accredited laboratories for use by Department of Defense components.

The EM CX responsibilities also included execution of the Defense State Memorandum of Agreement (DSMOA) Program on behalf of HQUSACE, the Army, and the Department of Defense. To execute this mission, the CX developed the DSMOA web portal, which included tools to perform program activities such as review of plans and budgets as well as the execution of payments and reimbursements to states and territories worldwide.

Accessed by more than 2,300 stakeholders and 1,800 installations, the portal saved more than $12.5 million per year by moving away from paper-based activities – an annual return on investment of 1 to 18.8.

In 2016, the EM CX partnered with the Army Environmental Command, HQUSACE, and ERDC to develop an early warning system – Evaluation and Assessment of Regulatory and Legislative Impacts – to help identify regulatory requirements to assist the Installation Management Command and the Army with future budgeting and resourcing requirements. [9]

Military Munitions and Chemical Warfare Design Centers

The Huntsville Center had supported ordnance and explosives waste removal projects since 1986, and chemical warfare materiel (CWM) removal projects since1993.

By 1995, this work had grown to the point the Huntsville Center created an Ordnance and Explosives (OE) Directorate. When HQUSACE created the EM CX in 2007, it continued to maintain the Military Munitions and CWM Design Centers in Huntsville in this directorate.

The Military Munitions Design Center provided assistance to Corps districts, military installations and facilities, and combatant commands in executing military munitions and environmental investigations and remediation actions, and served as contingency support National Program Manager for ordnance response actions.

The CWM Design Center was responsible for the investigation and remedial action for non-stockpile chemical warfare agents. The design centers directly supported customers' projects involving the investigation, removal, and remediation of military ordnance and CWM.

As part of maintaining a response capability, in 2009, the OE Directorate issued the $2.4 billion Worldwide Environmental Response and Services (WERS) multiple award task order contract (MATOC) to support ordnance and environmental response actions. A MATOC was a contracting vehicle awarded to a pool of pre-approved contractors who would bid on task orders, and the Huntsville Center had increasingly come to rely on MATOC vehicles because they were faster and often resulted in lower cost.

The initial WERS award was for $945 million for eight large businesses, followed by $1.15 billion award for seven small and Native American/Alaska Native businesses (15 businesses altogether). [10]

The OE Design Centers are key elements of the Corps' ability to effectively respond to ordnance and CWM issues. Along with the EM CX, the design centers helped to identify and test new technologies on projects.

The Huntsville Center then made available successful technologies to other Department of Defense organizations.

Methods for the detection of ordnance continued to improve, for example, through the MetalMapper scanning system that was much more accurate and precise and a submersible towed sensor array for detection of munitions underwater. Using data collected from MetalMapper, the design centers and EM CX began collecting ordnance signatures to "fingerprint" and distinguish among bombs, mortars, projectiles, and fuzes.

A major problem the design centers addressed was accessing range impact areas to conduct maintenance. Through a $2 million competition conducted through the Defense Advanced Research Project Agency, the center evaluated technologies to use robotics to clear vegetation from ranges.

In 2013, the design centers tested the technology at Fort A.P. Hill, Virginia, and at the Red Leg Impact Area on Fort Polk, Louisiana, and in 2015 at Fort Bragg, North Carolina. Another technology the design centers helped to develop and test was the use of seed balls to remotely plant grass in dangerous areas, which they tested at Fort Bragg and the U.S. Military Academy at West Point, New York, in 2013.

They also supported a project at a FUDS location at an Atlas F missile silo at York, Nebraska, polluted with trichloroethylene. Funded by the Environmental Security Technology Certification Program, the project involved the technology demonstration of H2T, a nitrogen-hydrogen-propane mixture injected into soil.

While most of these activities involved technology development and evaluation, the Huntsville Center also sometimes participated directly in research activities.

In 2009, for example, it participated with the Department of Defense and two other allies in experiments on ordnance debris distribution at the Woomera Test Facility, South Australia. The experiments collected data from detonation of 288 M1 105mm shells with a cumulative total of 2,200 pounds of explosives. The centers used this data to better predict ordnance dispersal and response. [11]

The Military Munitions Design Center started several new high-profile projects. Since 2009, workers had found more than 3,500 pieces of ordnance at Raritan Arsenal, New Jersey. After surveying an 84-acre site, contractors removed ordnance at 17 of 21 acres requiring clearance. This was one of the largest sites in which digital mapping played a major role.

At Martha's Vineyard, Massachusetts, the center became involved with clearing the Cape Poge Wildlife Refuge and South Beach. A former Naval firing range, the site was littered with MK23 practice rounds. Clearing the site involved the first major use of a man-portable simultaneous electromagnetic and magnetic survey system.

The FUDS site included environmental contaminants and munitions on Tanaga and Ogliuga islands that were by then part of Alaska Maritime National Wildlife Refuge. The sites were particularly challenging because of the distance – 1,200 miles – from Anchorage, and the Huntsville Center won the 2009 Secretary of the Army Environmental Award for the project.

The design centers also become involved in a project at Rock Island Arsenal, Illinois, after workers found unexploded ordnance at a housing project. Contractors cleared 4.12 acres by December 23, 2015. After investigating 5,200 anomalies, they found two live grenades.

Given the hundreds of environmental sites remaining, the Huntsville Center would be involved in design functions for decades to come. [12]

The CWM Design Center completed surveys at Pine Bluff Arsenal, Arkansas, and Aberdeen Proving Ground, Maryland, for the Chemical Materiel Command. Perhaps the largest site where the center responded was nearby Redstone Arsenal, Alabama.

The site of a World War II chemical munitions assembly plant and storage site, the base included more than 17 sites requiring clearance, including several with CMW. The $527 million project would take more than 30 years to complete. The first project started in 2010 at the Marshall Space Flight Center, and by 2016 intrusive investigation and removal had begun.

Another major site was in the Aleutian Islands, west of Alaska. The Army had built Fort Glenn on Umnak Island in 1942 as an air field to support a campaign to drive the Japanese from the islands. The long-term storage and burial of munitions and CWM, primarily 6,800 mustard-filled 75 mm MK II HS shells, required mapping of 32 acres on multiple islands. [13]

The International Operations Division within the OE Directorate was responsible for providing critical international support for military and contingencies operations.

Since its first contract award in July 2003 supporting Combined Joint Task Force 7 in Iraq with demilitarization of munitions, the program has evolved to include many proficiencies and support to other countries and government agencies. In 2016, the directorate renamed the division the Global Operations Group to better reflect its worldwide mission.

The group's competencies include battle area and range clearance, minefield delineation and mine clearance, sub-munition removal, unserviceable munitions disposal, small arms incinerator operations, issuing clearance certificates, depleted uranium removal and disposal, electrical life health and safety, and

environmental response services. Wherever possible, the group has hired, trained, and used local nations. [14]

Deployments and Disasters

While most of the environmental and ordnance mission focused on former and current U.S. installations, the Global Operations Group of the OE Directorate continued to support environmental and ordnance missions abroad. After 2007, the Coalition Munitions Clearance program in Iraq began to decline.

Lt. Col. Burlin L. Emery
May 2016 - July 2016

With turnover of the Bajii Depot to the Iraqi army in 2008, the mission shifted to the Coalition Munitions Destruction (CMD) program, in which the Huntsville Center continued to destroy unserviceable coalition weapons and any additional caches. Its sole destruction facility was located on Forward Operating Base Hammer in Besmaya, Iraq, near Baghdad. The disposal contractor executed the final destruction of ordnance November 12, 2011, marking the end of the Huntsville Center's Iraqi mission.

Just over a month later on December 18, President Obama initiated the final U.S. troop withdrawals from Iraq that had begun the previous year. Future operations would focus on stability operations and supporting or advising the Iraqi army under Operation NEW DAWN.

Over the course of the CMD program, center contractors destroyed 3,731 tons of unserviceable ammunition, 479 tons of enemy remnants, and 214 tons of United Kingdom munitions for a total of 4,400 tons destroyed. Since the beginning of operations in 2004, more than 70 civilian Huntsville Center personnel had deployed, as had hundreds of contractors.

Although a small number of U.S. forces deployed to Iraq again in 2015 to support the Iraqi army in defeating the Islamic State of Iraq and the Levant (ISIL), which invaded from neighboring Syria; as of 2016, the center had not become re-involved in destroying munitions, although that possibility remained if that mission increased. [15]

Even as the mission in Iraq declined and ended, the mission in Afghanistan began to grow. Although there were not the large stockpiles of conventional weapons as found in Iraq, Afghanistan had been the site of ongoing warfare since 1980; and there were many issues with unexploded ordnance and abandoned minefields, as well as improvised explosive devices used by insurgents.

Since 2004, the Huntsville Center had provided small numbers of on-the-ground personnel to assist and advise U.S. Forces-Afghanistan (USFOR-A) on ordnance removal and safety. However, explosive ordnance disposal (EOD) personnel or units on each base performed most of the work. Unfortunately, they lacked expertise to handle large caches or areas requiring clearance.

In 2009, at the request of USFOR-A, the center stood up a contracted ordnance removal program similar to CMD under Joint Munitions Disposal-Afghanistan (JMD-A). Seventy contracted employees working for two contractors – EOD Technologies and Sterling Global – under the center's oversight operated nine mobile teams that traveled to and destroyed ordnance caches.

JMD-A also involved destruction of NATO Condition Code H unserviceable munitions, captured enemy munitions, and explosive remnants of war. A major effort involved clearing an old Russian mine field near Bagram Air Field, which the center completed in 2015.

By 2010, JMD-A had expanded to include the removal of ordnance before any new construction. By 2013, center contractors had destroyed 1,600 tons of munitions up to .50 caliber in size, primarily through the use of open burn methods. When the program ended in 2016, the contractors had destroyed 5,629 tons of munitions. It afterward transitioned to an action center model, in which contractors would respond to ordnance issues on an as-needed basis. [16]

Another major effort in Afghanistan involved improvement of the energy grid. Concern about the safety of electrical installations had led the U.S. Central Command (CENTCOM) to create Task Force Safety Actions for Fire and Electricity (TF SAFE) in 2008, which eventually included operations in Iraq, Jordan, Kuwait, United Arab Emirates (UAE), Bahrain, Qatar and Egypt.

Another, Task Force Protecting our Warfighters and Electrical Resources (TF POWER), stood up in Afghanistan in 2009. These task forces sought to reduce electrical incidents by ensuring safe wiring of generators and buildings through inspection, update, and repair, including the development and execution of a Fire Safety Assessment and Training Program.

The Huntsville Center supported both organizations. In 2010, TF POWER awarded a $55 million contract to conduct fire and electrical safety inspections. Within a short time, the task force had inspected 6,845 facilities and identified 98,000 issues. This resulted in 2,867 energy projects performed by other contractors to rewire buildings or replace generators, of which 1,530 were high-priority.

The task force even addressed new issues, such as repairing a generator after an attack on Camp Integrity, where inspectors were working. While the initial goal was improving safety, the Army was also aware that the increasing efficiency saved lives – 20 percent of casualties occurred during logistical supply missions such as providing fuel for generators. TF POWER continued its work through 2016.

During the handover to civilian authority, the Combined Security Transition Command requested assistance in transitioning base power from generators to a permanent power

grid. The U.S. funded the effort at $100 million, and the other allies together contributed $200 million.

The Corps established a five-man team, which included Bernard Givan from the Huntsville Center and personnel from the ERDC. After conducting surveys, the team recommended establishment of a Power Delivery Power Purchase Agreement (PDPPA) to complete the work. The center used its Commercial Utilities Program MATOC to award the PDPPA to existing contractors. The award placed the center squarely in the job of restoring the country's power infrastructure. [17]

Finally, as follow-on to its ordnance work, the Huntsville Center also became involved in the environmental restoration of Afghanistan. USFOR-A often ran into environmental cleanup issues that local units lacked the experience to handle, such as cleanup of large fuel spills or disposal of lithium batteries. Such issues became more prominent as the U.S. began to prepare bases for closure and transfer to civilian authorities.

In 2012, the center proposed establishing Environmental Response Teams to rapidly mitigate and dispose of hazardous materials and waste. Under a $16 million contract, the center established three contracted two-person teams at Camp Leatherneck, Kandahar Air Base, and Bagram Air Base to respond to major environmental issues. This gradually increased to six teams with plans to decrease to a single team with the sunset of the program.

At one of the first responses – cleanup of a pharmacy at Camp Phoenix – the contractor was able to reduce the cost of cleaning the site from more than $2 million to less than $700,000.

The teams were quickly involved in more than 50 projects ranging from capping a landfill at Bagram to mold abatement at U.S. barracks to removal of lead and asbestos from legacy Russian buildings. The teams helped to dispose of more than 14,000 lead acid batteries and 1,701,000 kilograms of oil-contaminated soil accepted for bioremediation in soil land farms.

As of 2016, there were fewer than a dozen ongoing projects under a contract extension, and a new contract was in the request for proposal stage. [18]

In 2013 Huntsville Center Commander Col. Robert J. Ruch recommended to the USFOR-A Engineer a program to reduce the environmental footprint of U.S. installations to help transition bases to local authorities.

In addition to ordnance, a troop presence in the country going back to 1980 had resulted in considerable debris and trash in the country.

Under the Environmental Footprint Reduction program, the OE Directorate issued a $21 million contract in 2015 to reduce the environmental footprint at 60 bases. By October, seven teams of 300 contracted laborers removed 800 structures, 6,000 barriers, 3.3 million pounds of rock and wood debris, 4.3 million pounds of scrap metal, 7.3 million pounds of wood, 208,000 pounds of wire and cable, and 11,000 pounds of florescent lighting.

Perhaps typical of the work was sorting and removing aggregate and crushed concrete, which was expected to save the base $4.5 million.

Due to the level of effort, the center issued additional $10 million and $8.3 million contracts through 2016. The program was scheduled for completion in 2018. Another task the center supported was clearance of training ranges under the High Explosive Training Ranges (HETRs) Program.

Deployed forces had built numerous weapons ranges throughout the country to support combat preparations. To return range land to the civilian government, the center awarded a contract to Sterling Global Operations of Tennessee to complete surface clearance of ordnance or other contaminants at 55 identified ranges starting in December 2013. This expanded to 84 ranges consisting of a billion square meters of real estate, which the contractor was scheduled to complete by 2018.

A related mission involved supporting the Resolute Support (RS) mission, Department of State, Government of the Islamic Republic of Afghanistan's Directorate of Mine Action Coordination (DMAC), the United Nations Mine Actions Service (UNMAS), and the United Nations Mine Action Center for Afghanistan (UNMACA) to educate Afghan civilians on the risks of mines. As a direct result of this work, civilian casualties due to mines have declined from nine per month to one per year. [19]

These were only some of several missions that the center supported worldwide. For example, OE teams also supported range clearance in Japan and South Korea. Of these, clearing the Story Live Fire Training Complex, South Korea, for the 8th Army Training Support Activity Korea was the largest outside of Iraq and Afghanistan.

On a similar size and scope, the Missile Defense Agency requested clearance and construction support for a project in Poland.

Most recently, the Huntsville Center recently added a project for the Defense Security Cooperation Agency (DSCA) to clear approximately 17 million m2 on an existing range, near L'viv, Ukraine, at the International Peacekeeping and Security Center (IPSC).

It has also provided explosives site support at Department of State embassies in Lebanon and Iraq. It was largely due to the growth of such operations that the center issued the $2 billion WERS contract after 2009. [20]

While its work overseas was most prominent, the Huntsville Center was also involved in several domestic contingency operations despite not having the geographic responsibilities of a district.

Under the National Support Framework, the Federal Emergency Management Agency (FEMA) assigned the Corps to

Emergency Support Function 3 – Public Works and Engineering, which involved debris removal, power restoration, and temporary facilities or repairs.

In 2008, the Corps established the Readiness XXI program, which merged both overseas contingency and emergency operations into a single organization that reported to a G3 operations section headed by a director of contingency operations. Corps organizations down to the district level, including the center, adopted a similar organization to oversee all contingency operations.

In addition to tracking civilian personnel deployed to Afghanistan or Iraq, the G3 section also oversaw deployment of personnel to civil emergencies. Of these, there are several notable disasters the center supported. Perhaps the largest was the one that hit closest to home – the 2011 Alabama tornadoes.

On April 27, 2011, a line of thunderstorms moved through Mississippi, Alabama, and Tennessee, producing more than 120 tornadoes, including 15 that were Category Four or higher on the Enhanced Fujita scale. Eight tornadoes had paths longer than 50 miles. The tornadoes took a total of 316 lives, injured 2,800, and damaged or destroyed more than 23,000 homes.

"This was a hurricane in North Alabama," said Jim Byard, the Alabama Emergency Management Agency coordinating officer.

In Huntsville, the center shut down temporarily when the city lost power for more than two weeks. At the time, it did not have an emergency power plan and had contract out generators, which arrived within a few days.

Since Huntsville is within the geographic boundaries of the Mobile District, the center supported it in executing its disaster mission. The center received its first tasking from the district on May 17, and by May 26 there were 11 center personnel working for and with local authorities.

Its biggest role was to provide seven temporary housing inspectors. Neal Graham, an installation support program manager, served as resident engineer with FEMA in Madison County and assisted in delivering seven temporary facilities for local fire departments. [21]

The Huntsville Center supported several other disasters that same year – 2011 was very busy. During the 2011 spring flood on the Missouri River, three center employees volunteered to assist the Northwestern Division, primarily helping manage reservoirs on the river to control flooding.

Another employee volunteered to assist the Kansas City District when a major tornado struck Joplin, Missouri, on May 22. After it strengthened into an EF5 tornado six miles wide, it ran 22 miles through downtown Joplin. A total of 161 people died, making it the deadliest single tornado since detailed record-keeping began in 1950.

At $2.8 billion, it was the third costliest tornado of all time, adjusted for inflation.

In the aftermath of the storm, Huntsville geographic information systems (GIS) specialist Teresa Silence joined the recovery field office to assist with management of the recovery.

A third major event that the center supported was in September 2011 when Tropical Storm Lee hit and flooded the Pennsylvania coast. A housing planning and response team deployed from the center, completing its mission on November 30.

Most recently, the center provided one of six housing planning and response teams responding to the 2016 Louisiana Flood. Although it did not receive heavy news coverage, major floods struck near Baton Rouge throughout August 2016. [22]

Altogether, 20 Huntsville Center personnel deployed to support the recovery effort.

Installation Support

The second leg supporting the overall Corps mission was sustainability, which the Huntsville Center addressed through the Installation Support and Programs Management Directorate.

The center continued to be involved in maintaining Corps standards in facility design and construction. As the center of standardization for 16 facility types, the Huntsville Center had developed and maintained documentation on facilities such as fire stations, child development centers, and range facilities.

Under the Military Construction Transformation program, the center also became responsible for letting contracts to build standardized facilities. It had competed a contract to build child development centers in 2008, and in 2010, it broke ground on the first child care development center under this program for $10.4 million at Fort Belvoir, Virginia.

By 2010, HQUSACE had approved designs for standardized fire stations. The center continued to support the Army Facilities Criteria System (AFCS), a set of standardized documents for rapid construction. The center updated and maintained these criteria on the Internet and in 2011 contracted updates of 48 designs for $44 million.

Since 1987, the center had also been the Range and Training Land Program Mandatory Center of Expertise, responsible for overseeing design of standard weapons ranges.

In 2008, it completed one of its largest projects to date – a military operations in urban terrain (MOUT) range at Fort Irwin, California.

In 2010, it started modernization of rifle ranges at Fort Jackson, South Carolina, one of the Army's largest basic training installations. The redesign included a modified record range with

The constuction of military operations in urban terrain, or MOUT compounds at Fort Irwin, California, and Fort A.P. Hill, Virginia, shown above, were overseen by the Huntsville Center's Range and Training Land Program Mandatory Center of Expertise.

(Photo by Patrick Bloodgood)

144 targets and six support buildings. The range was 50 percent complete by 2013.

A major effort by the center involved development of automated range vegetation clearance with the Military Munitions Design Center at Fort A.P. Hill, Virginia; Fort Polk, Louisiana; and Joint Base Cape Cod, Massachusetts.

As of 2011, the center had updated more than 250 weapons ranges worldwide. [23]

The Electronic Security Systems (ESS) Mandatory Center of Expertise continued to grow dramatically due to ongoing security concerns in the post-9/11 world. The center completed surveys and studies, developed designs, researched and transferred technology, conducted training, gathered requirements (such as at a 2010 ESS conference), and developed and maintained guide specifications.

After working with the Naval Facilities Command (NAVFAC) to merge Army and Navy specifications, the center published the first unified guide specifications in May 2016. The center was part of an overall Electronic Security Center that coordinated with its counterpart at the Protective Design Center in Omaha District. Together, these centers provided a broad range of services embracing physical security, force protection, anti-terrorism, and vulnerability reduction.

The ESS center supported numerous high-profile projects, such as an upgrade of technology at the National Zoo and a series of 91 ESS projects in 2012 and 2013 at Fort McCoy, Wisconsin. It became heavily involved in the security of Ballistic Missile Defense System sites in Europe and elsewhere.

As with many other programs, the Huntsville Center had started to award large-scale MATOC contracts that allowed faster response to multiple project requests.

In 2012, the center awarded a $49 million contract to provide ESS services; in 2014, it awarded $200 million in contracts to seven small businesses. A MATOC awarding $2.5 billion to 13 small businesses in 2015 supported ESS, Metering, and Utility Monitoring and Control Systems. [24]

The largest ESS program remained the Access Control Point (ACP) Program. It also showed continued growth as the center increasingly worked with the Omaha District Protective Design Center of Expertise.

Beginning in 2009, the center started additional updates to 49 U.S. and 36 European ACPs. Major projects included ACPs at Fort Carson, Colorado, for $7.4 million; Camp George, Korea; Fort Belvoir, Virginia, for $17.1 million; Fort Rucker and Redstone Arsenal, Alabama; Forts Stewart and Gordon, Georgia; Fort Huachuca, Arizona; Fort Lewis, Washington; and Fort McCoy, Wisconsin.

By 2012, this had grown to 70 U.S. and 100 European installations. The center was about 66 percent complete with the upgrades, and it had completed 128 out of 138 funded ACP upgrades at 66 out of 70 U.S. installations.

For the first time, the center also supported ACP projects at Air Force installations starting with Holloman Air Force Base, New Mexico, in 2014.

In addition, the center had started its first major pilot project for the Automated Installation Entry Program at Letterkenny Arsenal, Pennsylvania. This program used automated car tag

readers and identification scanners to process people onto bases with minimal human interaction. Another test of the system occurred at six of 13 access control points at Fort Belvoir as part of a $17.1 million upgrade.

Although the technology was highly promising, there were still many technology issues that prevented widespread use of such technology, such as performance of sensors in various terrain and weather conditions. [25]

The Huntsville Center continued to have a robust procurement program, a service it had provided almost since its origin.

The Furniture Centralized Management program had grown to the point where there were 27 interior designers on staff in Huntsville. The program now included two major subprograms: the Unaccompanied Housing Program and Administrative Furniture.

The Unaccompanied Housing Program, which the center had developed in 1999 with the General Services Administration, could provide better housing furniture faster and at lower cost through centralized management than through individually-managed installation contracts. For example, in 2009 the center delivered $250,000 in furniture to Hunter Army Airfield, Fort Stewart, Georgia, within 19 days to support relocation of 92 personnel. This was the first furnishings project involving the Air Force.

In 2016, it provided 12,000 beds in 14 buildings for the Army Cadet Command's summer training program for under $5.8 million.

In the Administrative Furniture program, the center rapidly procured office furniture, including for the U.S. Army Reserve. In one case, the center replaced 8,000 pieces of furniture at 82 installations in Korea within 44 weeks.

Perhaps its largest project involved 23 contracts worth $14.6 million to relocate human resources from four locations to the Human Resources Center of Excellence at Fort Knox, Kentucky.

In 2013 alone, under the two programs the center supplied 26,601 beds and other furniture in 262 barracks buildings as well as 209 admin buildings for $132 million at a savings of $26 million. These programs provided overall cost avoidance of $335 million or 17 percent and 31 percent for BRAC moves. Thus, by providing products in bulk, the center saved money. [26]

A related program was the Integrated Medical Furniture (formerly known as the Integrated Medical Support Systems) Program. This program had grown from two small orders in 2006 to some 66 projects in 2012 worth $3.5 million. The newest addition to the Medical Furniture program was the Initial Outfitting and Transition (IO&T) Program, which focused on purchases for new construction. Thus, it worked hand-in-hand with the Medical Facilities Center of Expertise.

In June 2010, the center awarded a $409 million MATOC contract to five companies to support IO&T. By 2011, the program included 20 tasks for $57 million, including medical home construction at 11 communities. When the center held a conference on the program in 2014, more than 40 team members from across the Corps attended. Major projects included a $3.1 million project to outfit hospital expansion at West Point; $67 million for the Army Medical Research Institute of Infectious Diseases at Fort Detrick, Maryland; and a $90 million hospital project at Fort Hood, completed in 2016. Projects at Fort Bliss, Texas; Fort Riley, Kansas; Fort Irwin, California; and Camp Humphreys, Korea, addressed a total scope of $500 million. [27]

The Huntsville Center's maintenance and repair programs also showed strong growth. The largest contract to date under the Operations and Maintenance Engineering Enhancement (OMEE) program was a $165 million contract awarded November 8, 2010, to six companies to provide maintenance for ambulatory care services. After that point, OMEE grew about 20 percent per year.

In 2013 and 2014, it expanded to include $55 million per year to support the Air Force Medical Support Agency. The Facilities Repair and Renewal (FRR) program saw major facility repair projects at Joint Base Andrews, Maryland, for $5.4 million and Joint Base San Antonio-Randolph, Texas, for $73 million. Another project involved upgrades to high-altitude electromagnetic protection (HEMP) at Thule Air Force Base, Greenland, for $38 million.

The Medical Repair and Renewal (MRR) program also continued to expand, in large part due to ARRA projects, including a $450 million fire alarm system upgrade at the Madigan Army Medical Center on Joint Base Lewis-McChord (JBLM), Washington, in 2010; a $9 million renovation of the Nutrition Care Division at Evans Army Community Hospital, Fort Carson, Colorado; a $12 million renewal of McWethy Troop Medical Clinic on Fort Jackson, South Carolina; and a $7 million heating, ventilation, and air conditioning (HVAC) renovation at Fox Army Hospital on Redstone Arsenal, Alabama.

In fact, the program grew so much, the Public Health Service subsequently assigned its first liaison officer to the center. The program expanded with the addition of veterinary clinics in 2011, such as at Fort Sill, Oklahoma, and also through the addition of $34 million in Air Force projects in 2013 and 2014.

In 2013 alone, the center completed 175 projects valued at $350 million as well as $150 million in new renovation projects.

In the meantime, as the Facility System Safety Technical Center of Expertise, the Huntsville Center assisted Buffalo District in renovating civil works projects. [28]

One of the most recent additions to the installation support offerings of the Huntsville Center was the Facilities Reduction Program (FRP), through which the center decreased energy use through the elimination of unused buildings.

After competing an FRP services contract in 2007, the center

saw rapid growth in low-cost demolition services at numerous installations. It supported major projects at Moffet Field, California, for $2.6 million; Keesler Air Force Base, Mississippi, for $1.9 million; elimination of a National Aeronautics and Space Administration (NASA) wind tunnel at Langley Air Force Base, Virginia, for $3.75 million; reduction of 45 World War II-era barracks at Fort Benning, Georgia, for $1.4 million; as well as other projects at Fort Polk; Aberdeen Proving Ground, Maryland; and McAlster Army Ammunition Plant, Oklahoma. Such actions increased funding to more than $50 million by 2011.

Although most involved rapid demolition of buildings, the center took care to reduce their environmental impact and even won the 2012 National Demolition Association Environmental Excellence Award for demolition of the 60-year-old Pritchard Stadium at Fort Hood, Texas.

It experimented with recovering recycled material at a pilot project in 2014 at Fort Leonard Wood, Missouri. During demolition, the contractor was able to divert 63-73 percent of construction material from the landfill. The program rapidly expanded to include additional customers.

In 2011, the center supported removal of 13 Army Reserve buildings in Tuscaloosa, Alabama, after the April 2011 tornadoes made them unusable.

In 2013, the center added civil works facilities to FRP when it assisted with clearing flood-damaged facilities at Salt Creek, Texas.

In 2016, the center added FRP services to the Acquisition Gateway website, making such services widely available throughout the Department of Defense.

As a result, in 2017 the center received the Office of Management and Budget Best-in-Class designation. [29]

The newest installation support program the Huntsville Center began to support was the Defense Logistics Agency (DLA) Fuels Program. The center had supported the DLA since 1978 with environmental monitoring of fuel storage areas and in 1980 began development of maintenance manuals for 225 DLA fuel points on military installations worldwide.

In 2009, the DLA approached the center about assisting with program management and contracting support for recurring maintenance of these fuel points. The program began in 2010 when the DLA requested support at 17 installations. This quickly grew to 110 installations by the end of the year.

By 2012, the DLA had added 67 others, as well as 35 Navy installations, and in 2015, the program doubled through the addition of 200 Air Force sites. It was, therefore a tri-services program. As a result, center contractors were conducting 500 site visits per year. The program had two subprograms.

In the Recurring Maintenance subprogram, contractors performed quarterly to annual inspections that generated deficiency reports.

By 2015, the contractors were performing 1,219 site visits per year. In the Minor Repair subprogram, contractors corrected small deficiencies under government quality assurance review. These contractors provided 24-hour support and could execute very rapidly. In one case, after a vehicle hit a fuel point at Fort Hood, the contractor made the repairs within 24 hours.

By 2015, the contractors had completed 4,294 maintenance projects on 277 installations for $80 million. [30]

Because of the growth of installation support services across the breadth of Huntsville Center capabilities – procurement, repair, maintenance, and demolition – the center began to provide consolidated services to support all operations base-wide. Troop level reductions and ongoing rounds of BRAC had a dramatic impact on Army installations.

There had been a scheduled 45 percent troop reduction from 2010 to 2017 or from 570,000 active Army personnel to 490,000. There had also been a 58 percent reduction in civilian staffing, a 51 percent reduction in infrastructure, a 57 percent reduction in base operating budgets, and a 31 percent reduction in military construction.

The Installation Management Command began to rely increasingly on the Huntsville Center to fill the gap in addressing these reductions through long-running services. In fact, the center already had experience in providing holistic base solutions, as it had in 2011 at the JBLM in Washington, and created a master area development plan for two new combat aviation brigades.

After 2014, there had been enormous growth in center services contracts, and particularly small business contracts, whether for maintenance, the FRR program, the FRP program, energy conservation, or training range planning.

The Base Operations Program grew out of this situation as numerous installations requested center assistance with all of their maintenance and repair contracts.

Customers such as the National Defense University, Fort Irwin, Fort Riley, Fort McCoy, and the Special Operations Command requested the center to assist with maintenance contracts or to manage all infrastructure support and repair operations. For example, at the request of Fort Wainwright, Alaska, the center issued a $9.5 million single award task order contract (SATOC) to manage all operations and maintenance on the base, including a million acres of training areas.

In another case, the center supported the 88th Reserve Support Command in maintaining facilities at 300 locations in 19 states. [31]

Information Technology Services (ITS)

One of the newest ways that the Huntsville Center was supporting installations was through the Information Technology Services Office.

Prior to 2012, the center had assigned its Special Projects Office to manage several large IT acquisitions for ERDC, which sought assistance with acquisition so it could dedicate more time to research activities.

In November 2012, the center established an IT Services Office (ITS) to handle a surge in such requests from other agencies including the Army Publishing Directorate; the Program Executive Office Missiles and Space at Redstone Arsenal, Alabama; and Womack Army Medical Center, Fort Bragg, North Carolina.

At approximately the same time, the chief information technology officer and chief contracting officer in the Corps asked the center to take over acquisition and contract management of ACE-IT, the enterprise information technology services delivery team that had since 2007 provided enterprise-wide and local information management and information technology for the Corps of Engineers.

The center quickly approached its anticipated business growth of $500 million in contracts. Obligations grew from $117 million in 2013 to $500 million in 2016. Meanwhile, the ITS Program grew from a single person in 2012 to 25 by 2016; all indications were that this growth trend would continue. [32]

The ITS included four major acquisition programs supporting multiple agencies and contracting vehicles throughout the federal government.

High Performance Computing (HPC)-IT focused on high-performance computing solutions ranging from supercomputers to computer-aided design (CAD), GIS, and building information management (BIM). Major customers included the Department of Defense High Performance Computing Modernization Center, ERDC Information Technology Laboratory, CAD/BIM Technology Center, and the Naval Meteorology and Oceanography Center. Medical (MED)-IT addressed medical IT requirements, such as automated medication management, hospital core data centers, and way-finding centers.

Other major customers included the U.S. Army Medical Command (MEDCOM), Defense Health Agency Capital Region Medical Community, and U.S. Army Health Facility Planning Agency. Both of these were highly specialized areas that required technical expertise.

The center also operated two more generalized programs. ACE-IT had managed all Corps IT acquisition since 2007, and it remained a blended contractor-government entity that operated at 1,500 locations, including two data centers and a help desk. General (GEN)-IT met general IT requirements across the Department of Defense using various contracting vehicles, such as the Army Computer Hardware and Enterprise Software Solutions (CHESS). Under these programs, the ITS Office had more than 20 customers including in the Army, Air Force, and Navy. [33]

In 2015, the Huntsville Center picked up another new mission, which involved maintaining the information security of BIM and other facilities management systems. The program originated with the need to integrate Meter Data Management Systems with installation information infrastructure.

"I can't tell you how many times I went to the Pentagon and got chewed up and down by Ms. Hammack and Mr. Kidd over the Army metering program. ... The biggest challenge was the information assurance – the cybersecurity aspect of it. At that time, nobody had figured it out," said Col. Nello L. Tortora, commander of the Huntsville Center.

Electronic Security Systems also required secure networking and applications. Because of its involvement in standardization and maintenance, its considerable history in developing engineering systems, and its experience in facility and utility management systems, the center had gained expertise in computer system security as it related to engineering and maintenance.

Nevertheless, there was a huge void in Corps technical areas in cybersecurity.

In 2014, the center established a new branch in the Engineering Directorate focused on cybersecurity and quickly increased manning to four employees. The additional personnel helped write many Corps operations orders, guidance, and requirements regarding cybersecurity.

In 2015, HQUSACE named Huntsville the Industrial Control System Cybersecurity Center of Expertise. In this role, the center was responsible for promoting cybersecurity in all MILCON and operations and maintenance projects, including industrial control systems, HVAC, security systems, and utility management systems.

Although this was a fairly new and undefined business line, increased reliance on computer networks and the Internet made it a likely high-growth area in the future. [34]

Energy Programs

The third leg of the Corps' mission that the Huntsville Center supported was energy programs, which saw incredible growth after 2008. The center had been involved in energy conservation programs since 1978.

After 2000, the Energy Policy Act of 2005 and Executive Order 13423 had set energy reduction goals of 30 percent and water reduction of 15 percent by 2015.

With sequestration-induced budgetary constraints, it became more critical than ever to improve energy efficiency. Congress began requiring greater use of renewable energy and diversion of solid wastes from landfills through recycling or use of renewable components.

The Energy Independence and Security Act of 2007 (PL 110-140) required increased use of renewable energy, and the National Defense Authorization Act of 2010 (PL 111-84) required greater diversion of solid wastes within the Department of Defense,

broadened requirements for renewable energy, and prohibited open pit burning for disposal of wastes.

In Executive Order 13693 of 2015, President Obama required reduction of federal energy consumption by 2.5 percent annually through 2025 (for a total of 25 percent), a 2 percent reduction in water consumption annually (for a total of 20 percent), and a 25 percent increase in the use of renewable energy sources by 2025.

As a result of these laws and regulations, the Army established its Net Zero initiative in 2010 to build renewable energy projects with a goal of a net of zero consumption of nonrenewable energy. Katherine Hammack, Assistant Secretary of the Army (Installations, Energy, and Environment), was instrumental in this effort.

In 2011, the Army established an Army Energy Initiatives Task Force, which the Huntsville Center supported, to identify Net Zero projects. The same year, President Obama challenged federal agencies to facilitate $2 billion in energy-efficiency upgrades to federal buildings, which he expanded to $4 billion in 2014.

By then, the Army Energy Initiatives Task Force had become a permanent fixture in the Headquarters of the Department of the Army when the Army established the Office of Energy Initiatives to oversee large-scale capital investment projects. This office developed a close relationship with the center to meet its goals. The center supported Office of Energy Initiatives with projects greater than 10 megawatts and garrisons with projects less than 10 megawatts. [35]

The Huntsville Center supported Net Zero projects through a variety of programs and funding streams that spanned its energy programs. For example, early Net Zero projects included installation of wind turbines at Fort Buchanan, Puerto Rico, using Energy Savings Performance Contracting and a Commercial Utilities Program capital investment project at West Point.

The center developed several funding mechanisms to support Net Zero, starting with a $210 million MATOC to six small businesses for a variety of energy services.

In 2012, the Department of Defense pledged to establish three gigawatts of renewable energy sources on military bases by 2025. That year, the center invited 600 companies to attend a pre-request for proposal conference for a $7 billion renewable energy MATOC that ultimately included 67 different contractors and four major technologies.

It was not until 2015 that the center made the first awards using this contract for projects on Redstone Arsenal and Fort Campbell. In general, the center had found that, while individual renewable energy projects helped to make great strides toward the program goals, it could not reach Net Zero without also implementing conservation measures in a holistic approach.

"Net Zero is really just a goal … It was always about trying to bring everybody together and getting some synergy out of these programs versus just trying to hit some individual metric," Colonel Ruch said.

In 2015, the center introduced Energy Portfolio Management to build roadmaps to Net Zero installations using a variety of methods and contracting vehicles. For example, at West Point, the center developed the first comprehensive capital investment strategy, which included base and building assessments that resulted in a million-dollar planning effort using multiple programs to assist the installation reach Net Zero.

As a result of similar efforts, the center's energy team repeatedly won awards for their innovative and environmentally friendly designs, including the 2014 Secretary of the Army Energy and Water Management Award, the Department of Energy's 2015 Energy and Water Management Award, and the 2015 Corps Sustainability Green Dream Team Award. [36]

The Huntsville Center continued to support several of its long-running energy conservation and contracting programs. One of these was Energy Savings Performance Contracting (ESPC), for which the center remained the technical center of expertise. ESPCs were contracts to share savings between contractors and the government for the installation of energy-conserving measures.

As with other installation support areas, the center increasingly relied on consolidated contracts to speed delivery of services.

In 2009, it issued a $900 million contract to 14 companies to provide ESPC services. Major projects included $9.5 million for 10 projects at Fort Bliss, Texas, in 2010 and a $16 million solar power project in 2011; a $61 million project on Rock Island Arsenal to save 35 percent on energy costs in 2014; another at Letterkenny Army Depot for $43.6 million in 2015; and $50 million in contracts for solar power at White Sands, New Mexico; Fort Buchanan, Puerto Rico; and 11 U.S. Army Reserve centers. The center expanded the program in several ways.

In 2012, it began working with the Navy to develop ESPC contracts, starting with a $12 million contract for the Space and Warfare Command (SPAWAR) Systems Center, Pacific, in San Diego, California. The contractor made conservation upgrades to 225 buildings, which resulted in an estimated $23 million in savings over 19 years.

In 2014, the center added support to civil works projects through a $2.8 million proof-of-concept initiative to install high-mast lighting at the 10 locks and dams along the 234-mile Tennessee-Tombigbee Waterway, estimated to save $5 million over 21 years.

The center followed this with a $5.5 million project for three similar river-based navigation systems in the Pittsburgh District in January 2016, comprising lighting upgrades, thermostat installations, and transformer replacements, guaranteed to deliver 23 percent energy savings. It had numerous other projects in the works at the end of 2016.

The center also signed a memorandum of understanding in 2014 with the Department of Energy to support the Federal Energy Management Program, which allowed the center to support ESPC work outside of the Army, and a memorandum of agreement to support the U.S. Air Force. In 2015, the center issued a $1.5 billion third-iteration MATOC for ESPC services. [37]

A recently developed subset of ESPC was Utility Energy Service Contracting (UESC) – ESPC for utilities. The first UESC contract was at Fort Campbell, Kentucky, and involved a contractor installing a solar array in 2015 using a $3.1 million grant from the state and Department of Energy.

It reduced emissions by 4.7 million particles annually. The second phase – adding homes supported by the plant – began in 2016 under a $15 million contract. Another major project involved integrating HVAC systems at the Intelligence Community Campus-Bethesda, Maryland, with utilities along with a recapitalization project valued at $51 million. This project evolved as a result of a partnership with the Huntsville Center, the Defense Intelligence Agency, and the Baltimore District.

As the center became increasingly involved in capital investments of utilities and renegotiated utility contracts, the opportunity for UESC contracts would likely increase in the future. [38]

The ESPC and UESC programs have been particularly successful. The ESPC Program resulted in an average energy reduction of 8.75 percent per contract.

In 2015, the program won the Secretary of Army Energy and Water Management Award for producing annual savings of $8.5 million (9.4 percent average). In 2016, the center exceeded the president's goal of producing $12 million in savings for civil works projects through 2016. Then in August, the Army announced it had surpassed $1 billion through 96 ESPC and UESC contracts for 127 projects, which created total reductions in energy use of 68 percent in the Department of Defense and 33 percent in the federal government as a whole.

In fact, since 1992, the Army had completed 624 individual projects at an investment of $2.5 billion that resulted in the equivalent of 12.7 trillion BTU energy savings annually for the Army, enough to power nearly 350,000 average U.S. households per year.

The Huntsville Center's cumulative ESPC and UESC capital investment represented nearly 88 percent of the Army total and about 26 percent of the $4 billion President's Performance Contracting Challenge, which in turn helped the federal government to meet this goal.

As a result, a team comprising Department of Energy, HQUSACE, and center personnel earned the Department of Energy's 2016 Federal Energy Management Program Director's Award.

"This is a big milestone that shows not only how the private and public sectors can work together to achieve joint objectives, (but also) the hard work that agencies put forward to meet an ambitious goal," said Christine Harada, Federal Chief Sustainability Officer, in the White House Council on Environmental Quality. [39]

Another long-running program the Huntsville Center supported was the installation of Utility Monitoring and Control Systems (UMCS), for which it remained the mandatory center of expertise.

In 2009, the center awarded a $650 million MATOC contract to eight contractors to support UMCS installations nationwide. Contractors procured and installed the systems, as well as other automated systems for HVAC, fire alarms, metering, and security.

Among the projects these contractors supported were many ARRA projects. It completed 35 projects in 2009 for $3.7 million and 48 in 2010 for $24 million, for a total of 135 projects for $192 million. These installations also included renewable energy, such as when contractors installed a UMCS to manage solar energy at Fort Bliss.

In 2011, the center expanded this program to include the Navy when it awarded a $30 million UMCS contract to upgrade 38 Marine Corps Reserve Forces centers, which would reduce energy consumption by 20 percent annually.

By 2013, it had 224 active projects worth $561 million and 785 projects worth $294 million, averaging 17 to 20 percent energy savings. With the award of the $2.5 billion MATOC for UMCS, ESS, and Metering in 2015, the program was poised for continued growth in the decade to come. [40]

The longest-running energy program had been the Energy Engineering Analysis Program (EEAP), in which Corps contractors would analyze installation facilities to identify conservation measures. Audits conducted under the program were essential for planning effective energy management strategies and developing plans and projects to advance toward Net Zero or renewable energy goals.

In 2009, the center awarded 16 contracts to 14 contractors for $900 million to conduct analyses. Some of these were very extensive. For example, center contractors conducted audits of 71 installation commissaries for the Defense Commissary Agency, which used roughly 1 percent of all Department of Defense energy.

The center expanded this to include civil works projects by reviewing conservation measures of electric barriers used to deter carp in the Chicago Sanitary and Ship Canal.

In 2014 alone, the contractors had completed 27 audits that identified 412 conservation measures costing $9 million, which, if implemented, would result in an average savings of $1.3 million per year.

By 2015, the program reached the goal of identifying projects that would produce 25 percent energy reduction. The center had

by that time completed 138 surveys and identified 4,900 energy-saving measures over the life of the program that reduced energy costs by $154 million. [41]

One of the more recent energy programs the Huntsville Center adopted was the Metering Program to install more efficient, networked meters to better identify energy reduction opportunities.

Established by the Defense Reform Initiative, the program had grown quickly – the center estimated in 2008 spending would reach $20 million to $25 million annually.

In December 2008, the center awarded a $943 million indefinite delivery-indefinite quantity contract to support metering and a $50 million contract to develop meter management systems. It quickly put these contracts into use.

By 2009, the center had installed 3,000 meters on 36 installations for $19.2 million and had reached 3,151 or 47 percent of eligible facilities by the end of fiscal year 2009. This quickly grew to 7,000 by 2012 and 8,000 by 2014.

By 2015, the center had completed meter installation on 59 percent of identified facilities. Some of these installations could be quite large. For example, in 2010, center contractors supported a major project at Fort Knox, Kentucky, involving the installation of 341 electric meters and 182 gas meters in 235 buildings.

In 2013, it had 67 active projects worth $148 million. In fact, growth in the program was so great that in 2015 the center awarded a $2.5 billion MATOC for UMCS, ESS, and Metering.

The second part of the program involved developing a Meter Data Management System. In 2009, after a $2.8 million pilot project proved the system's value, the center oversaw development of multiple versions of the software and by 2012 four versions were network-approved. It installed the first systems in 2014 at the Presidio in San Francisco, California, and Joint Base Lewis-McChord, Washington.

A major outgrowth of this program was the launch of the Energy Information Management (EIM) program in 2015. This program sought to use analysis and visualization of energy consumption patterns obtained from the meters to determine steps to reduce energy consumption.

The center worked with ERDC and the Army Logistics Innovation Agency to develop the capability by integrating meters, business systems, and energy and water reporting systems. The center was in the process of developing pilot projects at Anniston and Tooele Army depots in 2016. [42]

One of the services that the Huntsville Center added after 2008 was in assistance to military installations with the support of commercial utilities.

The Commercial Utilities Program (CUP) provided evaluation of utility usage, guidance on utility rates, and assistance with contract renegotiation or intervention with commercial utilities. The Corps published initial guidance on the program in 2012 as a supplement to Army Regulation 420-41.

From the beginning, the program was a proven cost-saver with a return on investment as high as 17 to 1 by reducing commercial utility rates. It often saved $12 million to $24 million annually at a cost of $2 million per year.

For example, the center assisted Fort Knox with renegotiating its utilities contract to avoid a $1.3 million rate increase. It successfully intervened at Fort Riley, Fort Leavenworth, and Blue Grass Army Depot, Kentucky, to avoid penalties and interest, thereby saving $1 million in addition to annual cost avoidance.

By 2015, a $900,000 investment in the program had provided savings of $16 million and was saving $8 million in cost avoidance annually.

The Resource Efficiency Manager (REM) program worked hand-in-hand with CUP. Under REM, contractors worked with installation public works and reviewed utility use on an ongoing basis. It was, in essence, a permanent CUP capability. REM contractors often found irregularity in billing.

For example, it saved Fort Sam Houston, Texas, $2.6 million in correcting erroneous charges on bills and saved West Point $1.5 million in billing anomalies. REM contractors also identified conservation measures, such as conversion of an HVAC system at Fort Bragg, North Carolina, to save $6 million over 20 years, or adoption of solar lighting at Fort Ord, California, that saved $170,000.

By 2010, a total investment of $2 million in the program had saved $10 million and decreased energy use by 33.2 percent on average.

In 2014, the program had expanded to include the U.S. Army Reserve. The center added 11 new REMs to support the Reserve, which quickly identified $20 million in actualized savings. Interest in the program continued to grow, as demonstrated in the number of personnel who attended a 2015 REM conference. [43]

The Energy Conservation Investment Program (ECIP) also saw renewed interest during this time, although the program had existed for many years. This was an Office of the Secretary of Defense-funded program that supported new MILCON projects that changed utility use at an installation through improvement of supply or conservation.

HQUSACE had previously decentralized the program due to a lack of consistent activity. The focus of the program was on energy efficiency (65 percent of projects), renewable energy (25 percent), or water conservation (10 percent). The center held its first workshop on the program in 2014. The anticipation was that it would have 27 projects worth $113 million by 2017.

One of the first projects in 2011 was a $3.4 million, 55,262-square-foot solar wall to provide heat for a warehouse

at the DLA's Eastern Distribution Center in New Cumberland, Pennsylvania. HQUSACE approached the center about the project, and the Baltimore District helped to build it. More recently, the center was involved in a $22 million project at Fort Hunter Liggett, California, to help the installation meet Net Zero goals by 2020. [44]

Specialized Engineering

While the Huntsville Center was now focused primarily on its environmental, installation support, and energy missions, it continued to maintain its mission of supporting complex or specialized engineering projects nationwide.

The Medical Center of Expertise (MX) was responsible for design and contracting support for all medical facilities the Corps built, although other districts executed the contracts and completed the projects. The MX continued to have a very large workload and expected it to increase. Of the nearly 1,000 active medical or dental facilities, 41 percent were more than 40-years-old, and 72 percent were more than 20-years-old, requiring renovation and reconstruction.

By 2009, the MX had 80 projects worth $6 billion in design or construction. To support this workload, the center issued $249 million for eight IDIQ contracts in January 2010 to support the Department of Defense Medical Program.

The MX completed several large or important medical complexes. One major project was the completion of the $807 million Fort Belvoir Community Hospital. Construction of the 1.1-million-square-foot facility began in November 2007 and ended in 2011.

Another major contract was completion of the Army Medical Research Institute for Infectious Diseases at Fort Detrick, Maryland. The Baltimore District awarded the $511 million contract in 2009 with center support. The facility was completed in 2015.

A second facility worked through the Baltimore District was the $229 million Army Medical Research Institute of Chemical Defense at Aberdeen Proving Ground, Maryland.

In 2011, contractors broke ground on a replacement for the Carl R. Darnall Army Medical Center, Fort Hood, Texas. The $534 million contract was another funded by ARRA.

Another project at Weed Army Community Hospital at Fort Irwin, California, helped to meet Net Zero goals through the use of solar power, thereby winning the 2012 Chief of Engineers Awards of Excellence. [45]

Throughout this time, the Huntsville Center's original mission – ballistic missile defense (BMD) – had continued, although it had evolved considerably since its early years. The BMD System (BMDS) itself had continued to change as technology improved and the strategic situation altered.

By 2008, the BMDS, formerly the National Missile Defense Program, had evolved into a layered system addressing missiles throughout its flight path. A variety of detection technologies, including the Upgraded Early Warning Radar, Transportable Radar, Sea-Based X-Band, Space Tracking and Surveillance, and Aegis Spy-1 Radar, identified launches and tracked them during boost. Predator Unmanned Aerial Vehicles (UAVs) launched from aircraft carriers or U.S. bases in the Middle East, Europe, or Asia provided an early intercept capability. During the mid-course phase, Ground-Based Interceptors in Alaska provided the main defense.

President George W. Bush's administration had installed 16 missiles in Alaska by 2006; in 2010 the Obama administration started installation of another 30, along with a Ground Support and Fire Control System. Implementation of an additional 44 interceptors using a new missile version was due by the end of 2017.

The newest addition to the BMDS was the use of the Aegis missile (SM-3), which could address both mid-course and terminal phases. The Navy had deployed an earlier ship-based Aegis BMD system (SM-2) in the 1970s; in 2010, the Navy began deployment of the new missile system capable of targeting intercontinental ballistic missiles (ICBMs). It deployed these initially on 33 ships; 16 in the Pacific fleet, 17 in the Atlantic.

A second phase of Aegis deployment was due to begin in 2018 to provide more accurate and longer-range missiles as well as land-based launch sites.

In the terminal phase were the Patriot and Terminal High-Altitude Area Defense (THAAD) missiles originally developed for Theater Missile Defense, which also provided a regional intercept capability.

In addition to U.S. allies and NATO partners fielding the BMDS, numerous countries agreed to implement or purchase portions of it. Germany, the Netherlands, Saudi Arabia, and the United Arab Emirates implemented the Patriot missile system (PAC-3); Denmark, Turkey, and Japan implemented various radar systems after 2011; and Poland, Romania, and Japan have or are implementing ship- and shore-based Aegis launch sites from 2013 to 2018.

Through the use of many partners and mobile capabilities, the BMDS has the ability to be more proactive and effective than previous systems based only in the U.S. [46]

The Missile Defense Agency (MDA) had spent $123 billion since 2002 in developing and deploying the BMDS incrementally and planned on spending another $38 billion through 2020. As with previous BMD programs, only a small portion of these funds went toward construction. Of the roughly $7 billion annual budget for the MDA, about $500 million went to design, construction, or maintenance of facilities. Each increment delivered additional or improved capabilities.

Phase II, which started in December 2015, introduced improved tracking and discrimination of threats. Phase III, which was scheduled to start in December 2018, would improve response to intermediate range ballistic missiles. Each new increment required additional testing of BMDS components, often with allied nations, although the Government Accountability Office (GAO) criticized the program for frequent delays of tests and deployments – from 2010 to 2015, the MDA had delayed or canceled 40 percent of flight tests. Further, the MDA had delayed implementation of 12 of 27 capabilities after 2016 from three months to multiple years or indefinitely.

Many of these delays were due to integration of European requirements or to evaluate test results, with command and control elements being the most difficult part of the program. The delays and cancellation of some tests made it difficult for agencies such as the GAO to connect spending with specific results, especially since BMDS had not been part of the Defense Acquisition Program since 2002, which also garnered criticism. Nevertheless, the GAO credited the program for making continued progress. [47]

The Huntsville Center supported many of these elements through oversight of designs and construction of BMDS facilities. Its role had primarily been technical oversight of design and construction, which local districts contracted and executed.

Under a 2007 memorandum of agreement, the center's primary role was technical review and assistance in preparing DD 1391 forms needed for funding requests. After 2012, however, inconsistency in designs led to the MDA seeking to establish the Huntsville Center as a mandatory center of expertise to review designs. At the same time, it increased funding of the center to greater than $30 million annually.

In 2012, the center awarded a 5-year $60 million MATOC to two contractors to assist with the increased work. After 2015, center support of the BMDS grew from a single project manager to four personnel to conduct technical reviews.

A major project during this time involved support of the European Phased Adaptive Approach, a four-phased plan to place an Aegis platform on land in Europe. The center supported design of the first Aegis Ashore Missile Defense Complex on Hawaii as a test site, two additional facilities in Romania and Poland from 2013 to 2018, construction of a new sensor in Turkey in 2017, and installation of later upgrades.

The center also supported installation of a new sensor at Clear Air Force Station, Alaska.

On August 25, 2016, HQUSACE named the Huntsville Center as Mandatory Center of Expertise for BMDS for all Phase II acceptance testing facilities. This included, not only upgrades to existing facilities in Alaska, California, and Hawaii, but potentially additional missile and radar sites on the East Coast after 2020. Expectations were that the program would grow to $7 to 8 billion within a decade, requiring a staff of more than 16. The center was preparing to award a follow-on MATOC contract in 2017, as well as a small business contract to cover operations and maintenance tasks. Even at this level, however, the program would remain only a small part of work at the center. [48]

The Huntsville Center continued to develop, maintain, and support engineering systems for the Corps of Engineers. All of the engineering applications that the center maintained – DD 1391, ENG 3081, MII, and the Tri-Services Cost Estimation System (TRACES) – were stable, ran on Microsoft Windows platforms, and were accessible through the Internet.

The center continued to expand its web presence, for example by adopting the Armed Forces Public Information System web platform, which standardized the look and feel of Corps websites.

The center also began to use social media websites such as Facebook and Twitter, which it used increasingly to deliver information about the status of the center during weather events.

The largest part of the center's responsibilities regarding its software was continued training. For example, the center trained 155 personnel on TRACES at a conference in 2009. A major effort involved integrating the Corps of Engineers Financial Management System (CEFMS) and GIS to provide spatially based financial data. Use of GIS and BIM had expanded greatly, in large part due to the increased processor speeds of desktop systems. Even the smallest systems were now larger in capacity and speed than traditional workstations, allowing a broader range of interactive graphics programs for any employee without specialized hardware.

Thus, in addition to GIS and BIM, 3-D modeling was widespread in ordinary design programs. Use of such software was no longer the domain of a single section, but engineers throughout the building used them and developed templates or specialized profiles for these applications. [49]

Chemical Demilitarization Winds Down

Among the major engineering projects the Huntsville Center had supported since 1980 was the chemical demilitarization mission, which was nearing completion.

After 2008, the Chemical Stockpile Disposal Program (CSDP) had started to wind down as several facilities completed operations and were decommissioned.

Originating in 1980, this mission had been one of the longest-running and most complex the center had supported. The CSDP had made continual strides toward completion of the mission despite continued criticism of its costs. The GAO had complained in a December 2007 report that the program still lacked cost controls necessary to prevent continued growth in the long-term cost of the program, and it noted especially that guidance published by the Department of Defense in 2006 lacked specifics about construction schedules after 2012.

At the same time, it noted the attempts from 2003 to 2005 to improve management of the program had resulted in faster than

anticipated destruction rates at all of the plants that remained open, with some sites being up to 39 months ahead of schedule.

Destruction of weapons on Johnston Atoll was complete, and so was destruction at the neutralization plant at Aberdeen Proving Ground, Maryland. Less than a third of the items remained at the Newport, Indiana, neutralization plant. It had the smallest stockpile in the U.S. and quickly completed operations. Contractors had torn down all of these plants by the end of 2008.

At the incineration plants at Umatilla, Oregon; Tooele, Utah; and Pine Bluff, Arkansas, less than one-third of the stockpiles remained, and two-thirds remained at Anniston Army Depot, Alabama. Destruction had not started yet at neutralization plants at Blue Grass, Kentucky, and Pueblo, Colorado. [50]

The earlier-constructed chemical agent disposal facilities continued to make progress in destroying the remaining U.S. stockpile.

The Anniston plant had started operations in 2003 and, after destroying 46 percent of the munitions at that location, paused in 2008 to change over operations from destruction of VX gas projectiles to land mines and then to mustard gas. It destroyed the last munitions at Anniston on September 22, 2011.

The plant remained open for several months as the employees destroyed contaminated material and cleaned up the plant. The number of employees dwindled from 170 at the end of operations to 40 at the time it closed in early 2013 and demolition began.

This was the first full-sized plant in the U.S. that the Huntsville Center oversaw from start to finish.

At Pine Bluff, the chemical demilitarization facility completed destruction of 12 percent of the U.S. stockpile in November 2010, and remediation of the site concluded in 2013.

The Umatilla plant started operations in 2004 and completed destruction of 12 percent of the U.S. stockpile in October 2011.

The Tooele Chemical Disposal Facility had gone online in 1996, switched over to destruction of mustard gas munitions, and completed destruction of 43 percent of the nation's stockpile in January 2012.

The Huntsville Center was not directly involved in the plants during decommissioning other than assisting with removal of a munitions washout facility at the Tooele Depot in 2008, a highly dangerous operation due to explosives residue inside the facility.

All four facilities had earned the Occupational Safety and Health Administration Star Status due to maintaining stricter safety standards than the average office environment. These four facilities together resulted in the destruction of 90 percent of the U.S. stockpile as of 2012. [51]

Construction finally proceeded on the chemical agent destruction facilities that remained incomplete at Blue Grass Chemical Activity, Kentucky, and Pueblo Chemical Depot, Colorado. Both plants would use a neutralization process.

Construction of the Blue Grass plant began in 2006. The plant would use a supercritical water oxidation process to destroy nerve agents supplemented by a static detonation chamber used to destroy 15,000 mustard gas 155 mm projectiles. While funding issues caused some delays, construction had restarted by 2009, although it continued to proceed slowly.

Construction was quite innovative. Through the use of self-consolidating concrete technology, builders could now fill hard-to-reach pockets in the blast walls, which reinforced and improved the concrete density.

By 2010, center contractors were installing equipment. Although the work was very dangerous, the contractor won the Star Status award for safety from the Occupational Safety and Health Administration in 2012, and by 2015, construction was complete. The plant would destroy 523 tons of nerve agents once operational verification was complete.

The Pueblo plant proceeded much more rapidly under a $1.1 billion contract to Bechtel National to design and build the facility.

Although construction began only in 2008, it was 50 percent complete by 2010 and 99 percent complete by 2014. The plant completed destruction of its first weapon on March 18, 2015, and began pilot testing in September 2016. It would destroy 2,611 tons of mustard gas in 900,000 rounds using neutralization followed by bio-treatment.

However, even after operations started, the Huntsville Center had to add another electrical substation to support the facility, which was drawing near-full capacity from the existing electrical grid.

On November 20, 2016, the plant was the site of the first major CSDP-related accident when a ruptured seal on a 30-day storage tank released 450 gallons of hydrosylate, a by-product of neutralization.

Only three days later, teams discovered a leak in the secondary containment system used for bio-treatment. In both cases, the response teams contained the spills without injury or ill effect.

"The staff responsible for spill response performed exceedingly well," said Greg Mohrman, the site program manager. [52]

Although most Huntsville Center employees had recognized the chemical disposal program had substantially ended by 2014, the center formally ended its construction mission with completion of the Blue Grass facility in 2015.

The center afterward entered an era of supporting operations at the two remaining facilities on an as-needed basis. This included advising on engineering components during operations or making adjustments during operational testing. Other

than supporting any environmental or ordnance mitigation requirements, it would play no role in decommissioning. As operations ended, the role of the center and its level of funding greatly decreased. Funding declined from $177 million in 2007 to $25 million in 2016 or less than 3 percent of the center's total budget, and the center anticipated it would continue to decline. As a result, the center closed the Chemical Demilitarization Directorate in June 2016.

"Nobody in the Corps ever does that, but we were," Colonel Ruch explained, and then you "find something else to do — sunset that mission and if another mission comes along you do it."

The Ordnance and Explosives Directorate would afterwards oversee any remaining support to the existing plants. [53]

Huntsville Center work for the Defense Threat Reduction Agency (DTRA) in Russia also began to wind down.

Construction of the chemical weapon destruction facility at Shchuch'ye, which began in 1996, finally ended in 2008 after resolution of construction issues. This was largely due to the Trilateral Arrangement of 2007, in which Russia assumed responsibility for construction using best practices, the U.S. assumed responsibility primarily for oversight and verification, and local contractors completed the work.

After verification testing, the plant destroyed its first weapon March 5, 2009, and by April 30 it had destroyed 12,000 tons of chemical agents. The plant commenced full operations on May 29, 2009, other than a U.S.-funded production facility at the plant completed by the end of the year.

Total U.S. investment in the plant was more than $1 billion. The plant would destroy 40,000 metric tons of agents amounting to 14 percent of the Russian stockpile, including 32,500 tons of nerve gas, of which 5,440 tons were stored at the nearby Planovy base. The plant used a neutralization and bitumization process in which it embedded the inert ingredients of the weapons in asphalt-like bituminous blocks for long-term storage.

Unlike U.S. plants, in Russia the military rather than civilian contractors conducted most of the work, so operations at the plant, once constructed, proceeded more rapidly.

Among those who attended the opening was retired Indiana Sen. Richard Lugar, who had led the effort to establish the Cooperative Threat Reduction Program that supported Russian demilitarization efforts.

With completion of a plant at Kizner in the Udmurt Republic in December 2013, there were now five chemical weapon destruction facilities in operation in Russia, of which the Corps of Engineers had supported construction only of the pilot plant at Shchuch'ye. [54]

Despite this progress, relations with Russia had started to change after 2009. Russian leaders made several negative comments about continued U.S. involvement in Russian demilitarization, and in June 2013 Russia allowed the agreement of 1992 based on the Nunn-Lugar program to expire.

Russian leaders opposed the agreement partly because of its embarrassment over the fact that it had to rely on outsiders for the country's own domestic security and partly because of changing political circumstances. Russia was becoming more aggressive in asserting its regional leadership and had related demilitarization efforts to ending U.S. deployment of a BMDS to NATO nations. The following year, Russia's military intervention in Ukraine created the greatest international tensions since the end of the Cold War.

Nevertheless, the Obama administration negotiated a new bilateral agreement, which Russian President Vladimir Putin signed only days after the expiration of the old one. This agreement focused primarily on U.S. assistance with preventing nuclear proliferation. In it, Russia assumed responsibility to destroy its chemical weapon arsenals, thereby ending future U.S. involvement in this program.

In any case, by this time Russia had made considerable progress in demilitarization. As of December 2013, it reportedly had destroyed 71 percent of all chemical weapons. By the end of 2014, it had destroyed 85 percent of chemical weapons using its four remaining operational plants, including the one at Shchuch'ye. At that rate, it would complete destruction well before the extended deadline of 2020 under the 1993 Chemical Weapons Convention. [55]

In the meantime, other opportunities supporting the DTRA in the region cropped up.

In 2008, the Huntsville Center consulted with Azerbaijan on construction programs related to preventing proliferation of biological agents, and it soon after assisted with the construction of the New Central Laboratory in Almaty, Kazakhstan.

This was a state-of-the-art medical research center similar to the Centers of Disease Control and Prevention in Atlanta, Georgia. It would research infectious diseases, such as the Asian bird flu, as well as assist with monitoring biological agents.

The Huntsville Center assisted the DTRA with design and construction management of the $102 million facility, forming a network of biodefense centers to include one in Azerbaijan and another in Tblisi, Georgia, which the Huntsville Center did not support.

The facility in Kazakhstan opened on September 27, 2014. The DTRA was looking at additional facilities in Africa and elsewhere, but as of 2016 the Huntsville Center had fulfilled only a consulting role. [56]

Continued Growth and Quality

By 2016, the Huntsville Center had grown exponentially since its days as a Corps of Engineers division. Its budget reached more than $1 billion in 2010, $2 billion in 2014, and $2.5 billion in

2015. Predictions were that it would exceed $3 billion in funding by 2017. A single mission area – installation support (including energy) – was by itself more than $1.7 billion or roughly 66 percent of its budget in 2013.

The center was responsible for numerous multi-million-dollar programs: Metering, ESPC, EEAP, REM, CUP, UMCS, FRP, MRR, FRR, OMEE, Medical, MILCON Transformation, ESS, and ACP. These ranged in size in 2013 from $12.5 million for CUP to more than $380 million for ESPC.

When Colonel Ruch took command in 2012, the center was managing 42 programs, an incredible number for an organization the size of a district.

The center also grew in personnel. It increased employment from 550 in 2007 to 875 in 2013, of which 750 were in Huntsville, 53 in Omaha, and 24 in Afghanistan. In 2015, this declined slightly to 868, including 23 temporary employees.

The most significant organizational change occurred Corps-wide with the addition of a G3 Operations Section, which reported directly to the commander. Configured similarly to most Army commands, the G3 section became responsible for daily activities, including the center's participation in emergency and contingency operations.

In the center, its primary function was to funnel orders, engage the right people, and track any requirements.

Largely because of this growth, the organization had outgrown its existing facilities, requiring it to house personnel at various locations around the city.

In 2009, the facility support division moved to a suite across the parking lot in University Square, and 200 employees from the Ordnance and Explosives Directorate moved in 2011 into the former so-called "White Tiger" building, where a printer of the same name had its offices.

In 2011, the center renovated its warehouse on Bradford Drive to house additional office space. The center continued to discuss the possibility of expanding its facilities or building a new facility that could house the majority of its employees. Such dramatic growth suggested that the future of the center remained bright even with the expected decline of its longest-running mission – chemical demilitarization. [57]

The Huntsville Center's pursuit of quality had continued unabated, and it continued to use numerous programs and activities to achieve results. Many of these activities were HQUSACE-directed.

While Lt. Gen. Robert Van Antwerp remained Chief of Engineers, the center participated in his "Good to Great" campaign, which focused on superior performance, increased standards, and a strong bench of highly technical employees.

Later Chiefs of Engineers, including acting Chief Maj. Gen. Merdith W.B. "Bo" Temple and Lt. Gen. Thomas P. Bostick, initiated new efforts, such as holding annual strategic planning sessions with each command within the Corps of Engineers.

At the first of these in 2010, General Temple observed, "Huntsville Center is indeed on the road to great, but I do think you are at the foundational level…. This first review is clarifying the way ahead. Then we will be clarifying the metrics. We will continue to move forward, hopefully on autopilot."

The 2011 session identified six lines of effort for quality improvement: high-quality services, technical expertise, better communications, establishing benchmarks, innovative acquisitions, and becoming the employee organization of choice.

The 2012 review emphasized more consistent delivery of services and the need for the center to connect quality metrics with specific results, yet HQUSACE also noted that the center was a "strategic asset" within the Corps.

The 2015 strategic review looked at civilian hiring processes, external audit tracking, information sharing, and contingency operations, but it was also about "the things we think [Headquarters] can help us with to move the USACE Campaign Plan forward," said Colonel Ruch.

HQUSACE also directed a manpower study of the center in 2014. Over two weeks, the Corps Manpower and Force Analysis Division interviewed 60 employees to determine the right number of personnel for the mission set. It was the 14th unit assessed. [58]

Meanwhile, the center also continued to participate in several quality programs. Although it no longer competed in the Army Performance Improvement Criteria contests, it did continue to monitor customer satisfaction through regular customer surveys – one of the major metrics that it tracked.

By 2010, customer satisfaction reached 4.49 out of 5.0, or just slightly under 90 percent. Major issues identified were follow-through on corrective actions and reporting to customers, which the center sought to address.

By 2015, customer satisfaction reached a height of 91.6 percent. Much of this improvement was due to the C.A.R.E. quality policy, introduced in 2009, which emphasized continuous improvement, accountability, reduction of waste, and execution of mission. The center had continued to pursue and maintain International Standards Organization (ISO)-9001 certification.

Initially, it focused on adding additional processes to its certification and gaining recertification in 2010.

A major effort involved improvement of the quality management system. In ISO-9001 terminology, this was the policies and processes required for planning and execution of a core business area. Although such systems often included software as an organizing principle, the system was more than merely information technology or documentation but included the totality of efforts to improve quality.

In 2011, the center trained 15 auditors in quality management systems. To improve the quality management system, the center withdrew from 2012 re-certification efforts to review all of the 236 documents that explained center quality processes.

"The problem we had is we had far too many of these processes and it really got to be unwieldy. It was very difficult," Colonel Tortora said.

The center published the quality management system on its SharePoint site in 2015 and added a new quality policy based on this system. Yet as of 2016 it had not recertified the entire organization for ISO-9002, although it maintained standards sufficient to obtain certification if necessary for specific projects.

"We kind of ran what I would say is 'ISO-certifiable' without the inspectors," added Colonel Ruch. [59]

At the same time, the Huntsville Center continued to apply Lean Six Sigma to its quality improvement efforts. It held several rapid improvement events using curtailed Lean Six Sigma principles to gain a rapid improvement in a specific work area. In this way, they could identify quick fixes to process problems.

In 2009, for example, the center was able to reduce unnecessary contracting steps, which potentially saved $500,000 per year by reducing the number of steps in environmental contracting from 43 to 26 and eliminating up to 239 days to complete some actions.

In another case, the center improved the task order process, resulting in $1 million to $3 million in cost avoidance. Through the application of the MII cost-estimating software, the center was able to greatly improve the MRR cost estimate process.

The center continued to train personnel on this methodology, adding four greenbelts in 2014. In 2013, the center also began to implement Continuous Process Improvement (CPI), which combined Lean Six Sigma with the Theory of Constraints in a continuous improvement effort.

Each of these methods concentrated on different elements of quality. Lean focused on waste during production due to added time or unnecessary steps; Six Sigma focused on defects during production due to error or mismanagement; and the Theory of Constraints focused on bottlenecks resulting from limited resources at specific points in a process. The CPI process thus reviewed all production processes in a continuous review process that identified and eliminated issues periodically when they arose.

The center first applied CPI to UMCS, MRR delivery, and program acquisition and pre-award processes. By applying CPI to Resource Management Training processes in 2015, the center was able to eliminate 20 steps and cut 57 days from the training payment lifecycle (63 days down to six). [60]

Since its origin as a Corps of Engineers division supporting a national ballistic missile defense system, the Huntsville Center has always fulfilled a unique niche within the Corps.

It initially managed large systems engineering and construction programs that were highly technical, national in scope, and involved multiple geographic districts and divisions.

In 1978, HQUSACE started the transition of using the center to manage programs that supported all districts through the development of standardized guidance, tools, and training on Corps processes. By 1980, it had begun to use the center as a testing ground for new programs, projects, and technologies as the center of expertise for more than a dozen programs.

Based on Huntsville's leadership in this area, HQUSACE redesignated it an Engineering and Support Center in 1995 serving the entire Corps community.

While some construction programs – primarily the BMDS, Chemical Demilitarization, and Medical Construction programs – had continued, these were now only a small portion of the Huntsville Center's overall mission set.

By 2016, the center had completed its transition from construction programs to worldwide delivery of services. This had required a cultural change in the center. Employees had to alter their view of the center from a division executing district-level activity to a broader command and headquarters element.

One sign of this transition was the growing number of senior managers (GS-15) needed to coordinate with agency headquarters across the federal government.

By 2017, the center had achieved this transition as the older generation began to retire and new personnel brought a fresh perspective to the center's global missions and operations. It truly was an engineering agency without borders. [61]

The Huntsville Center's unique role in the Corps, which in the U.S. was mostly decentralized and geographically focused, sometimes created misunderstandings with Corps districts.

Accusations of the center "poaching" work had continued, but were prominent primarily during budgetary downturns when districts were looking for work to keep personnel gainfully employed.

In fact, the center operated mostly in niche areas usually not pursued by other organizations. Center missions met specific needs in three areas.

First, its missions focused on areas where centralized program management was more efficient than decentralized programs. It was inefficient to maintain resident experts at the district level for programs that took only a small portion of their time. By combining or centralizing these efforts across the Corps, it was much more efficient. A good example was the Base Operations Program. Providing maintenance to a single installation within a district was not cost-effective; maintaining installations across the country was. In this way, the center made sure the Corps as a whole met all customer needs, even when a job was too small for individual districts or installations.

In this way, the center was "the shock absorber for the Corps," Colonel Ruch explained.

Second, center missions involved new or unique technologies or processes, where it was inefficient or impossible to maintain experts at every district in the country. HQUSACE had named the center as a center of expertise for dozens of programs over its history. Some of these centers lasted only a few years.

As more districts learned about these new systems, processes, and technologies, a centralized model no longer made sense, and districts began to execute the work.

One of the responsibilities of most of these centers of expertise has been to train others in their subject matter. Some centers were permanent because the level of technical expertise or the safety of the program required it.

Only a single ESS MCX has remained because of frequent technological changes and not enough work to maintain that expertise at the district level. There is only one CWM Design Center because safety requires centralized control.

Third, center missions involved high-tech construction that was global in reach. The BMDS remains the best example of this – only centralized management led to standardization and consistency.

In all of these areas, however, the center worked with districts to execute its mission. Largely due to the outreach efforts of Colonels Tortora and Ruch, the rest of the Corps has begun to see and appreciate the center's role. [62]

The Huntsville Center was also unique in its approach to quality. In 1995, Col. Walter J. Cunningham set the center on the path to achieving greater quality, although there had been sporadic and ongoing quality improvement efforts before. More than any previous commander, he stressed the need for the center to operate like a business.

Unlike other Corps districts, the center operated almost entirely on a reimbursable budget rather than congressionally appropriated programs. Like a business, it had to keep customers happy to win new work or maintain good customer relations. His introduction of the Army Performance Improvement Criteria Program vastly improved quality at the center.

Later, adoption of ISO-9000 helped the center gain another boost through the documentation of processes. Lean Six Sigma helped to make fast improvements in multiple areas. Although the center ended attempts to gain ISO recertification, this was not because it abandoned these roots. Rather, the center had gained all it could from these processes and moved to a position where it used whatever standard or process was necessary to continue making gains and keep customers happy.

"When I say that quality is important, and we use the customer and the stakeholders as the determining factor of providing quality and I'd say for the most part we are reaching the level of their expectations, if you use them as a yard stick, … we're doing a great job in quality," Charles Ford said.

Without such satisfaction, the center could not operate. Yet even in the field of quality, the center was a ground-breaker, such that HQUSACE held up its efforts in APIC and ISO as examples to other Corps organizations on how to lower cost and improve customer relations. During periods of budgetary constraints, quality and customer satisfaction have been of the utmost importance to keep customer relations high. [63]

For 50 years, the Huntsville Center has been a unique and important organization within the U.S. Army Corps of Engineers. It has been the primary agency supporting districts with missions that are geographically dispersed and highly technical or that require centralized management, standardization, or specialized expertise.

The center has been the source within the Corps of leading technical expertise in missile defense, HEMP, chemical demilitarization, medical construction, environmental cleanup, ordnance removal, ESS, ranges, energy conservation, and numerous other programs and capabilities.

It remains the primary trainer of the Corps community in these areas. As long as there are global and technically advanced missions that require centralized management, acquisition, and expertise, there will be a need for an organization like the Huntsville Center. The recent focus on the environment, efficiency, and energy reduction has only increased demand for the services the Huntsville Center provides. With a workload more than $2 billion annually, the center is well positioned to continue its service of the Corps community well into the future.

End Notes for Chapter 8

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Appendix A

U.S. Army Engineering and Support Center, Huntsville Commanders

Maj. Gen. Robert P. "Rip" Young, October 1967 - November 1970

Brig. Gen. Bates C. Burnell, November 1970 - April 1973

Col. Lochlin W. Caffey, April 1973 - June 1975

Col. John V. Parish, Jr., June 1975 - October 1977

Col. Dale E. Dobson, October 1977 - October 1979

Maj. Gen. Max W. Noah, October 1979 - September 1980

Col. John A. Poteat, Jr., October 1980 - July 1984

Col. R.E. Abbott, July 1984 - February 1987

Col. Robert S. Lindsay, February - July 1987

Col. Charles T. Myers, III, July 1987 - April 1990

Col. Phillip L. Hall, April 1990 - June 1992

Col. Robert D. Brown, III, July 1992 - June 1995

Col. Walter J. Cunningham, June 1995 - August 1999

Col. Harry L. Spear, August 1999 - August 2003

Col. John D. Rivenburgh, August 2003 - July 2006

Col. Larry D. McCallister, July 2006 - June 2009

Lt. Col. David Bailey, June 2009 - July 2009

Col. Aniello L. Tortora, July 2009 - July 2012

Col. Robert J. Ruch, July 2012 - May 2016

Lt. Col. Burlin L. Emery, May 2016 - July 2016

Col. John S. Hurley, July 2016 - Present

Appendix B

U.S. Army Engineering and Support Center, Huntsville Personnel and Funding

Year	Personnel	Funding
1968	**95**	**$264 million**
1972	**857**	**$154 million**
1977	**332**	**$310 million**
1982	**431**	**$ 96 million**
1987	**524**	**$177 million**
1992	**574**	**$406 million**
1998	**502**	**$500 million**
2002	**624**	**$809 million**
2007	**550**	**$ 1 billion**
2012	**821**	**$1.7 billion**
2016	**855**	**$2.14 billion**

Due to inconsistent availability of data, numbers were not available each year or the same month each year. Readers should be aware that in some years employment and budget estimates varied widely from month to month.

Appendix C

Centers of Expertise

Centers of Competence or Expertise

- Army Pollution Abatement Program (1978-1982)
- Energy Monitoring and Control Systems (1978-1987)
- Training Range Program (1981-1987)
- Army Facilities Component System (1981-1987)
- Army Ammunition Plants (1981-1987)
- Energy Engineering Analysis Program (1981-1987)
- Railroads on Government Property (1981-1987)
- Mobilization Designs (1982-1989)
- Chemical Demilitarization Facilities (1982-1987)
- Third-Party Energy Contracting (1983-1987)
- Child Development Facilities (1986-)

Mandatory Centers of Expertise

- Army Pollution Abatement Program (1982-1986)
- Intrusion and Detection System / Electronic Security System (1983-)
- Electromagnetic Pulse/TEMPEST Shielding (1984-1987)
- Army Range and Training Land Program / Range Modernization (1987-)
- Utility Monitoring and Control Systems (1987-)
- Explosive and Ordnance Waste / Military Munitions (1990-2007)
- Medical Facilities (2005-)
- Environmental and Munitions (2007-)
- Ballistic Missile Defense System (2016-)

Technical Centers of Expertise / Directories of Expertise

- Solid Fuel Conversion (1981-1990)
- Operation and Maintenance Engineering Enhancement (OMEE) Program (1987-)
- Railroad Improvement Program (1987-1992)
- Explosive Safety and Blast Design (1987-1993)
- Electromagnetic Pulse/TEMPEST Shielding (1987-1993)
- Third-Party Energy Contracting (1987-)
- Shared Energy Savings Contracts / Energy Savings Performance Contracting (1990-)
- Demand-Side Management (1991-)
- Heating, Ventilation, and Air Conditioning / HVAC (2002-)
- DD 1391 and ENG 3086 (2004-)
- Facility Systems Safety (2005-)
- Installation Support (2007-)
- Facility Planning and Military Construction Programming (2007-)
- Facility Reduction (2007-)
- Access Control Points (2007-)
- Barracks/Office/Medical Furniture (2007-)
- Facilities/Medical Repair and Renewal (2007-)
- Industrial Control System Cybersecurity (2015-)

Appendix D

Chronology

1955 Development of BMD began under contract with the U.S. Army Ordnance Corps.

1961 First successful test of BMD interceptor.

1964 China tested its first nuclear device.

1966 China tested its first ICBM; HQUSACE established Nike-X Planning Group.

1967 China tested its first thermonuclear device; Secretary of Defense Robert McNamara announced deployment of BMD system (Nike-X, renamed SENTINEL); HQUSACE established HND.

1968 Construction on SENTINEL began.

1969 President Richard M. Nixon ordered review of SENTINEL and reorganized program as SAFEGUARD; Construction on SAFEGUARD began.

1970 HND issued largest Corps construction contract to date of $137 million contract to Morison-Knudson for construction for radar site at Grand Forks, North Dakota.

1971 HQUSACE selected HND to support U.S. Postal Service Modernization Program.

1972 President Nixon signed and the Senate ratified the SALT I Treaty limiting BMD systems to two sites; HND issued first contract under Postal Service Modernization Program; NASA requested HND support on Space Shuttle Program.

1973 HQUSACE selected HND to support MPBSCP.

1974 Huntsville tornadoes of April 3 killed 11, injured 40, and destroying 25 buildings on Redstone Arsenal; all work on Postal Service Modernization Program ended; ERDA requested HND support building fossil fuel demonstration plants.

1975 Stanley R. Mickelson SAFEGUARD Complex, Grand Forks, South Dakota, became fully operational; HQUSACE tasked HND to procure equipment for the Jordanian Armed Forces tank assembly plant.

1976 Congress placed Stanley R. Mickelson SAFEGUARD Complex in caretaker status; HQUSACE selected HND to procure equipment for Saudi Arabian King Khalid Military City.

1977 NASA accepted Space Shuttle Program facilities; ERDA became part of the Department of Energy (DOE); DOE requests the HND's support building Strategic Petroleum Reserve (SPR) storage facilities.

1978 HQUSACE assigned the APAP, AFCS, Guide Specification Maintenance, Construction Evaluation Program, CAEADS, and the Corps of Engineers Training Management Division to HND.

1979 HQUSACE assigned the HND to support the EEAP and EMCS; HND Commander Brig. Gen. Max W. Noah supports construction of Israeli air bases.

1980 The HND began support of LoAD; HQUSACE assigned the division to develop protective designs for Army Communications Systems Agency.

1981 USATHAMA requested the HND support chemical demilitarization and DERP-IRP; HND began support of the Railroad Improvement Program and Army Range and Training Lands Program; HND completes work on SPR; HQUSACE named HND TCX for the Solid Fuel Conversion Program; support for medical procurement began.

1982 FEMA requested support with key worker blast shelters; HQUSACE tasked the HND with the PREP; HQUSACE named the division MCX for APAP and Third-Party Energy Contracting; JACADS and TOCDF design contracts awarded; construction began on BZ Plant, Pine Bluff, Arkansas.

1983 First "M" Designs completed; HQUSACE named the HND as MCX for IDS; President Ronald Reagan makes "Star Wars" speech.

1984 Mississippi Army Ammunition Plant completed, the first new AAP since World War II; first ranges constructed under the Army Range and Training Lands Program; first ESPC contracts awarded; HQUSACE assigns HND DERP-FUDS inventories.

1985 Work on 23 installations completed under Railroad Improvement Program; DLA and DRMS requested division support with DERP; JACADS construction contract awarded; HND receives initial funding for SDI; work began on GBFEL-TIE.

1986 Design of Louisiana RDX/HMX plant began; HND began first ordnance removal project at Hawthorne AAP, Nevada.

1987 HQUSACE named the HND MCX for the Army Range and Training Lands Program; construction completed on the Tom Bevill Center for Professional Development and Continuing Education; IDS MCX signs MOU to support AMC.

1988 Chemical demilitarization program reorganized as CSDP; BZ Disposal Plant began operations; first BRAC commission met.

1989 Withdrawal of Soviet troops from Eastern Europe marked end of Cold War; TOCDF construction contract awarded; design of Ground-Based Radar proceeded; DISKO ELM nuclear test detonation; HQUSACE tasked HND to support NASA Advanced Solid Rocket Motor test facility; HND completed first Marine Corps training range; EEAP baselines completed; IDS MCX signs MOU to support Intelligence and Security Command; HND began MAGLEV research.

1990 GBFEL-TIE project ends from lack of financial support; STARBIRD launch facilities completed; HQUSACE named the HND MCX and Design Center for OEW; support of Hanford Federal Facility cleanup began; BZ Disposal Plant ended operations; JACADS began operational verification; HQUSACE assigned the HND as the lifecycle project manager for CSDP; Russia and U.S. sign Bilateral Destruction Agreement; MPBSCP Program reorganized; MOU to update all Marine Corps ranges; conversion of AFCS to AutoCAD; HQUSACE designed HND as TCX of OMEE.

1991 SABIR test facility completed; George H.W. Bush initiates NMD program; HTRW MCX established at Omaha District; second BRAC commission met; construction began on Anniston, Alabama, Chemical Disposal Plant; Cooperative Threat Reduction Program established; Operation DESERT STORM; HQUSACE named HND TCX of DSM; division developed Defense Fuel Supply Point operation manuals; ISTEA passed funding MAGLEV program.

1992 HQUSACE named the HND the lifecycle project manager of the NMD program; launch of DERP-FUDS data base; USACE removed from BRAC process; HQUSACE assigned HND as construction agent for CSDP; HND became responsible for CEFMS; HND developed MRR contracts.

1993 Construction completed on TOCDF; ordnance removal at first major CWM site began at Spring Valley, Maryland; final NMI report on MAGLEV completed

1994 Advanced Solid Rocket Motor test facility completed; HND discontinued support of "M" Designs; HND moved to new building on University Square; HND began support of TMD program.

1995 Huntsville Division renamed U.S. Engineering Support Center, Huntsville; HNC adopted APIC; design completed on first THAAD facility; PBSCP transitioned to Industrial Operations Command.

1996 Training Directorate became U.S. Army Corps of Engineers Professional Development Support Center reporting to HQUSACE; HNC announced first contract on the Internet; construction of CAL in Moscow began; design of Shchuche'ye Chemical Weapons Destruction Facility began; HQUSACE named HNC CWM Design Center; construction complete on GBR-P; TOCDP became operational.

1997 HNC ported CAEAS applications to Microsoft Windows; construction began on ANCDF and UMCDF; DRIDs set goals of privatizing utilities on military bases and reducing the number of facilities; CWC went into effect.

1998 HNC awarded Presidential Quality Award; OMEE expanded to include civil works facilities; 1st MATOC for UMCS awarded.

1999 Construction at NECDF began; HNC and GSA launch Unaccompanied Personnel Housing Program; HQUSACE established Medical Facilities MCX at HNC.

2001 9/11 terrorist attacks on Pentagon and World Trade Center; ordnance removal program reorganized as MMRP; OE CX and Design Center reorganized as MM CX and Design Center; ordnance removal decentralized to districts; ANCDF and UMCDF construction complete; construction of CAL complete; construction began at second NMD site at Fort Greely, Alaska.

2002 Beginning of Operations ENDURING FREEDOM and IRAQI FREEDOM; PBCDF and ABCDF construction complete; U.S. withdrew from ABM Treaty (SALT); IMA established; HQUSACE named HNC HVAC DX; ACP Program began.

2003 HNC support to CENTCOM CEA Program began; full operations began at ANCDF and ABCDF.

2004 "Florida Four" Hurricanes; PAX system expanded to include National Guard; HNC named TCX for DD 1391 and ENG 3086; CENTCOM CMC Program began; construction began at NMD site at Vandenburg AFB, CA; DOD established Facilities Reduction Program.

2005 Hurricane Katrina; full operations began at PBCDF and NECDF; HQUSACE named HNC FASS DX; Energy Policy Act set major energy reduction goals.

2006 Destruction at ABCDF completed; construction of BGCDF began; MILCON Transformation Program began; IMCOM assigned HNC as manager of Centrally Managed Administrative Furniture Program.

2007 HNC became ISO-9000 certified; ACE-IT assumed management of USACE IT; MM and HTRW CX merged as EM CX under HNC; HQUSACE named HNC IS CX.

2008 CMC Program transitioned to CMD Program; NECDF completed operations; construction of Shchuche'ye plant complete.

2009 Congress passed ARRA (PL 111-5) providing funding for renewable energy projects; JMD-A program began in Afghanistan; TF POWER established in Afghanistan; DLA requested HNC support with fuel point maintenance; HNC issued major ESPC MATOC; HNC started development of Meter Data Management System; destruction at Shchuche'ye plant started.

2010 DERP-IRP support to DLA ended; first ordnance removal project began on Redstone Arsenal, Alabama; IO&T program launched; launch of Net Zero Program; destruction at PBCDF ended.

2011 Congress passed Budget Control Act (PL 112-25) introducing sequestration; final destruction under CMD program in Iraq; Operation NEW DAWN began; tornadoes cause major power outage in Huntsville; Base Operations Program began; Army Energy Initiatives Task Force established in response to President's Performance Contracting Challenge; destruction at ANCDF and UMCDF ended.

2012 ESTs in Afghanistan began cleanup operations; establishment of ITS Office; HNC provided first ESPC contract to Navy; HNC launched CUP Program; destruction at TOCDF ended.

2013 Environmental Footprint Reduction program in Afghanistan began; ESS, UMCS, and Metering MATOC awarded; HNC began deployment of first Aegis Ashore Missile Complexes.

2014 HNC provided first ESPC support to Corps civil works and Department of Energy; establishment of Office of Energy Initiatives; construction of PUCDF completed; New Central Laboratory in Kazakhstan completed.

2015 ISIL invaded Iraq; HQUSACE named HNC Industrial Control System Cybersecurity CX; EO 13693 established new energy reduction goals; HNC established Energy Portfolio Management; HNC established EIM Program; construction of BGCDF completed; testing at PUCDF started.

2016 U.S. became a signatory of the United Nations Framework Convention on Climate Change or Paris Accords; HNC helped develop EARLI regulatory warning system; Congress passed Chemical Safety for the 21st Century Act; end of JMD-A program; HNC exceeds $1 billion in energy contracting; HQUSACE named HNC MXC for BMDS; HNC closed Chem Demil Directorate.

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