

AMRDEC **50**
YEARS
Staggering Accomplishments...
Limitless Possibilities

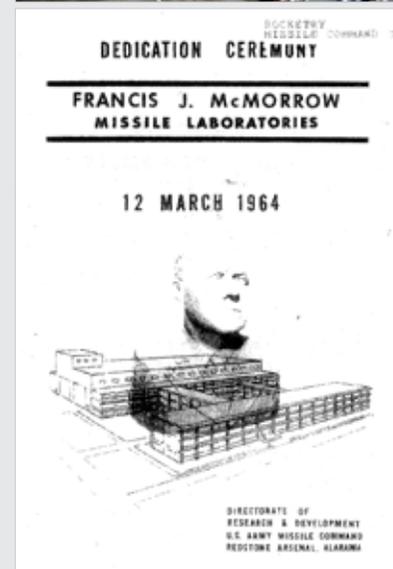
2014



1964

*Staggering
Accomplishments...
Limitless Possibilities*

Commemorating 50 years of the McMorrow Laboratories and celebrating decades of AMRDEC accomplishments.



Introduction

The Francis J. McMorrow Laboratories at Redstone Arsenal have housed 50 years of excellence in aviation and missile research and development. From the rockets that gave birth to America's space program to today's cutting edge use of unmanned aerial vehicles, the technology developed in this facility has helped ensure American military power and Soldier protection.

At the dedication of the Francis J. McMorrow Missile Laboratories on March 12, 1964, Lt. Gen. Frank S. Besson Jr. stated, "possibilities of work to be performed in the labs are staggering...the attainments limitless." The \$4.4 million research and development facility stood as tangible evidence of the Army's dedication to providing the best equipment in the world to the American Soldier. Guests at the dedication ceremony, including Governor George C. Wallace, State Representative Harry Pennington and Mrs. Francis J. McMorrow, heard of the scope of research and development of new weapons that was underway, such as the integration of free flight rockets and guided missiles, the Lance ballistic missile and the two-stage Pershing missile. Thirty years later, the mission of the Labs expanded to include aviation research, development and engineering, ushering in a new era of innovation.

Army scientists and engineers who would "flex their mental muscles" in this facility for years to come, planted seeds of patriotism and proud dedication. These values continue to propel the engineers and scientists who serve America through their work at the U.S. Army Aviation and Missile Research, Development and Engineering Center (AMRDEC). Our workforce continues to reach for new heights, following in the footsteps of past generations and leaving their own legacy for the future.

The following pages highlight significant achievements in U.S. Army aviation and missilery since 1950. Although these powerful capabilities were only recently brought together under AMRDEC, their rich histories demonstrate well-coordinated efforts across the aviation and missile communities to provide state-of-the-art technology for our servicemen and women, wherever they are deployed.

Staggering accomplishments, limitless possibilities.



1950-1959

During the 1950s

Beginning in 1947, Cold War tensions kicked off the space race between the U.S. and USSR, and sparked the need for longer-range, more accurate rockets and missiles. The U.S. feared a Soviet ground attack, wanted a stronger deterrent, and wanted an American answer to the launch of Soviet Sputnik satellites. Army missiles became more accurate, lethal, longer-range, and mobile. They were used to demonstrate American superiority in space exploration. A key Army system was the Pershing missile, which was developed at Redstone Arsenal. The Pershing II was directly involved in drawing the Cold War to an end. American technological advancements in the early years of the Cold War, such as the Honest John Rocket, the Redstone Missile, the Jupiter Missile and the Nike Hercules Missile, laid the foundations for enduring military dominance and elevated the American Soldier's status as an agent of dominant power.

Honest John in the Field

June 1954

The Basic (M31) Honest John rocket system becomes the first U.S. tactical nuclear weapon to be issued to Army Field Artillery units.

1950s

Staggering Accomplishments



Chickasaw in Korea
March 1951

H-19 Chickasaw helicopters participate in the Korean Conflict to move cargo and personnel.

Hermes Showcase
May 1953

The first Hermes guided missile is put on display in Huntsville, Alabama, as part of the city's celebration's of Armed Forces Day. It is the first Army Ordinance guided missile ever to be placed on public display.



Huey's First Flight
1956

The iconic UH-1 "Huey" helicopter has its first test flight. More than 7,000 Hueys would fly during the Vietnam War and 16,000 would be built by the end of the 20th century—the largest production run of any helicopter in history.



America's First Satellite
January 31, 1958

A Jupiter-C rocket propels Explorer I into earth orbit, a landmark achievement for the Army Ballistic Missile Agency (ABMA) at Redstone Arsenal.



Redstone Abroad
June 1958

The Redstone becomes the first large U.S. ballistic missile to be deployed overseas.

1950 1951 1952 1953 1954

1955 1956 1957 1958 1959

Redstone Rocket
June 1950

The Ordnance Guided Missile Center (OGMC) was commissioned to develop a surface-to-surface ballistic missile with an objective range of 500 miles, which ultimately became the PGM-11 or Redstone Rocket.



Nike Ajax Deployment
May 30, 1953

The MIM-3 Nike Ajax missile is first deployed around the nation's major urban areas and vital military installations.



Chinook Development
1956

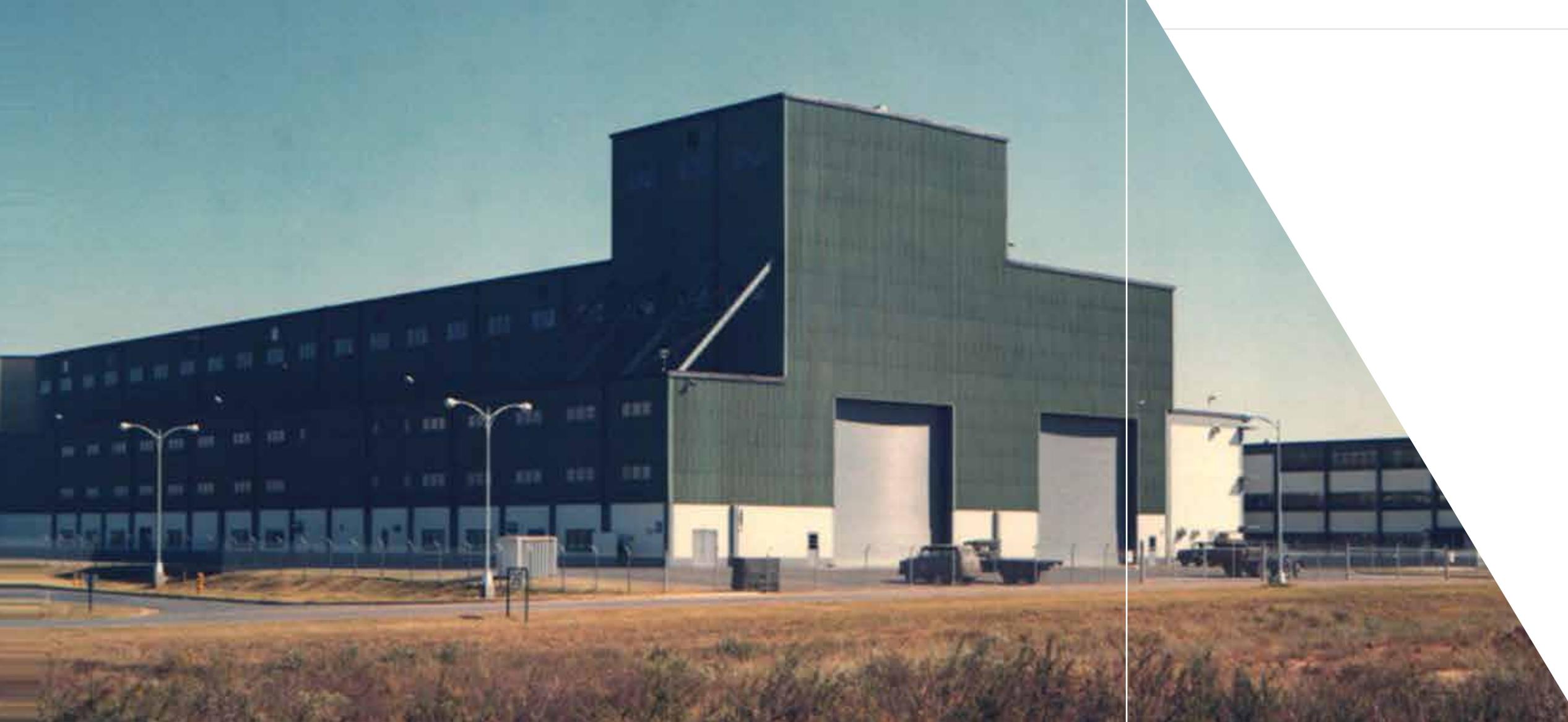
Development of the medium lift CH-47 Chinook begins.



Nike Hercules
November 1958

In another significant milestone for Redstone Arsenal, the MIM-14 Nike Hercules achieves the first intercept of a ballistic missile in flight.





1960-1969

McMorrow Laboratories

1964

The McMorrow Laboratories earned the nickname "The Big Green Monster" because of its original color and visibility on the Arsenal.

During the 1960s

By the 1960s, helicopters had emerged as a vital tool in American efforts. The Vietnam War created the need to rapidly deploy troops and resources, and rescue the wounded in otherwise inaccessible terrain. Helicopters fulfilled those needs—transport, attack, search and rescue, and medevac. Rotary-wing aircraft were made possible by improvements in fuels, engines, aircraft design and gearbox technology in the first half of the 20th century. Subsequent design improvements included increased cabin room, speed, and lifting capability.

At home, Redstone Arsenal was hosting the Design of Experiments in Army Research, Development and Testing Conference, which brought the nation's top scientists and engineers in missile and space to Huntsville. In 1964, the Arsenal reached a major milestone when the Secretary of Defense proposed that Redstone become the home of the highly-funded Nike-X missile system. In the same month, the Arsenal rolled out the Tube-launched Optically-tracked Wire-guided (TOW) Anti-Tank Missile that was designed to provide infantry ground troops heavy assault firepower against tank attacks.

1960s

Staggering Accomplishments



Chinook
September 21, 1961
The initial flight for the CH-47 Chinook takes place.



Army Nike X
August 30, 1963
Army Nike X missile system successfully intercepts target 5,000 miles away.



TOW Anti-Tank Missile
February 26, 1964
A new anti-tank missile is developed for infantry ground troops.



Airmobile Concept in Action
1965
The 1st Cavalry Division (Airmobile) is organized and sent to Vietnam, where it repeatedly demonstrates the validity of the airmobile concept in actual combat.



Cobra in Vietnam
September 1967
The AH-1G Cobra arrives in Vietnam to partially replace the Huey helicopter in its gun ship capacity. Other important helicopters in Vietnam include the CH-47 Chinook, the OH-6 Cayuse, the OH-58 Kiowa, and the CH-54 Tarhe.



Chaparral
1969
The MIM-72 Chaparral was the result of U.S. Army Missile Command (MICOM) studies and tests on feasibility of adapting the Navy's air-to-air Sidewinder missile for surface-to-air use.

... 1960 ... | ... 1961 ... | ... 1962 ... | ... 1963 ... | ... 1964 ...

... 1965 ... | ... 1966 ... | ... 1967 ... | ... 1968 ... | ... 1969 ...

Redeye
October 1961
The first complete FIM-43 Redeye, a man-made portable missile system, round with a live warhead is shoulder-launched.



Huey in Vietnam
April 1962
The UH-1 Iroquois, or "Huey," arrives in Vietnam, as a medevac. Eventually, the Huey would be used for command and control, and transport. The Army operated several fixed wing aircraft in Vietnam, to include: the L-20 Beaver, OV-1 Mowhawk, the U-1A Otter, the CV-2 Caribou and the L-19 Bird Dog.



McMorrow Lab Dedication
March 12, 1964
The dedication of the Francis J. McMorrow Missile Laboratories at Redstone Arsenal.



Cayuse Development
1968
The OH-6A Cayuse is designed for use as a military scout during the Vietnam War.



1970-1979

During the 1970s

Helicopter warfare became the most important innovation of the Vietnam conflict, which spanned the years of 1956 – 1975. Among the many outstanding helicopters that continue to serve today, one became an icon of the Vietnam War era and a legend in Army aviation: the UH-1 Huey. The rugged and reliable helicopter not only carried Soldiers into and out of battle, and rescued the wounded, but also helped the Army develop its air mobility concept. Vietnam veterans recall that when wounded, the sight of a Huey on the horizon meant safety.

The Airborne TOW went into combat in May 1972, becoming the first American-made guided missile to be fired by U.S. troops in combat.

PATRIOT mobile equipment, the HELLFIRE missile, the Hughes YAH-64 Apache and the FIM-92 Stinger missile were in development and/or testing at the Arsenal by the end of the 1970s.

Airborne TOW

May 1972

The Airborne TOW goes into combat, becoming the first American-made guided missile to be fired by U.S. troops in combat.

1970s

Staggering Accomplishments

America's "Helicopter War" March 1972

With the arrival of the UH-1 Huey, other turbine-powered aircraft, and two airmobile Army divisions, helicopter warfare becomes the most important innovation of the Vietnam conflict.



Black Hawk October 1974

The first flight of the Sikorsky UH-60A Black Hawk.



Stinger Hit February 1975

Developed by U.S. Army Missile Command (MICOM), a Stinger guided test vehicle scores a direct hit against a long-range, 400-knot target.



First HELLFIRE Firing September 1978

The first programmed HELLFIRE missile is fired at Redstone Arsenal.



Kiowa, Huey Pairing 1979

The OH-58A Kiowa is commonly paired with the AH-1G "Huey" Cobra. The Kiowa flies low to draw enemy fire—"trolling" for fire—marks the target, and calls in the Cobra to attack.



Cheyenne, Apache Development 1970

The U.S. Army begins developing the AH-56 Cheyenne and the AH-64 Apache.



Lance September 1973

The first MGM-52 Lance missile battalions are fielded.

Apache Prototype December 1976

The Army selects the Hughes YAH-64 Apache for production.



GSRS/MLRS March 1979

Vought launches the first GSRS/MLRS "six-pack" launch pod/container from a Self-Propelled Launcher Loader (SPLL).





1980-1989



During the 1980s

By the 1980s the Army missile team was building large numbers of many of the weapons developed in the 1960s and 1970s. There was new helicopter development during this time; the U.S. Army adopted/planned the OH-58D Kiowa Warrior, the RAH-66 Comanche and a new training helicopter. By the end of the 80s, the AH-64 Apache and the UH-60 Black Hawk were introduced. The TOW II was improved and fielded and work began on a Fiber-Optic Guided Missile demo program.

In 1985, the Army Missile Laboratory was re-designated the Research, Development and Engineering Center and resourced to serve as a technical center of excellence.

The Army TACMS

December 1989

The Army Tactical Missile Systems (TACMS) completed development and testing.

1980s

Staggering Accomplishments



Apache Production Approval

March 1982

The AH-64A Apache receives approval for production.

FOG-M Development

1982

The Missile Research, Development and Engineering Center (MRDEC) begins the Fiber-Optic Guided Missile (FOG-M) Technology Demonstration Program.



1980 1981 1982 1983 1984

Mast Mounted Sight

1980

The Mast Mounted Sight enables the Kiowa Warrior to engage the enemy at the maximum range with minimum exposure.



Improved TOW II Deployment

April 1981

The first deployment of the improved TOW II to U.S. Soldiers in Europe is completed, and the system is fielded in October 1983.



Operation Urgent Fury

October 1983

UH-60 Black Hawk is used in Operation Urgent Fury.



Apache

April 1986

The AH-64 Apache helicopter is introduced to Army service.

1985 1986 1987 1988 1989

Army Missile Laboratory Redesignated

May 1985

The Army Missile Laboratory is redesignated the Research, Development, and Engineering Center in compliance with AMC directions to establish RD&E centers to serve as technical centers of excellence and to assure maximum return on investment.

Operation Prime Chance

August 1987

The new Army helicopter, the OH-58D Kiowa Warrior, is employed in the Persian Gulf.



Avenger Rollout

November 1988

The rollout ceremony for the first two Avenger fire units is conducted in Huntsville.



Operation Just Cause

December 1989

The AH-64 Apache self-deploys from the U.S. and engages in combat for the first time in Operation Just Cause, the American invasion of Panama.

HELLFIRE in Panama

December 1989

The HELLFIRE is used for the first time in combat during Operation Just Cause in Panama.





1990-1999

During the 1990s

The onset of Operation Desert Storm created new challenges for the Army. Iraq's desert terrain created a need for deep strike capability to fragment enemy defensive positions, and to fire warheads further and faster. In response, missiles were engineered with increased system mobility, accuracy, and extended ranges for overwhelming force. This conflict gave the Army its first opportunity to fire, in combat, weapons systems such as the PATRIOT, the Multiple Launch Rocket System (MLRS) and Army Tactical Missile Systems (TACMS). U.S. troops used these weapons, as well as HELLFIRE, TOW and HYDRA-70, against Iraqi munitions. The MLRS played a critical role in the early defense of Saudi Arabia; Iraqi soldiers called barrage from MLRS "steel rain."

Aircraft serving the Army during the conflict included the AH-64 Apache, the AH-64D Apache Longbow, the OH-58 Kiowa and the AH-1 Cobra.

Army Aviation's Opening Strike

January 1991

In the early morning, an Army aviator fires the first shot of Operation Desert Storm from an Army helicopter.

1990s

Staggering Accomplishments



TACMS Deployed
January 18, 1991

The Army Tactical Missile System (TACMS) is fired for the first time in combat.

Javelin First Firing
July 1993

Javelin "fire-and-forget" antitank missile system is first fired.



Comanche Prototype
January 1996

The first flight of prototype RAH-66 aircraft No. 1 occurs.



Aerial Targets Laboratory

March 1999

The Aerial Targets Lab was established to support aerodynamic analysis, design, and testing of Army's aerial targets.



Apache Longbow Development
December 1, 1990

The Longbow Apache system enters full-scale development, following an extremely successful proof-of-principle (POP) phase.



PATRIOT
January 18, 1991

The U.S. Army Missile Command - developed MIM-104 PATRIOT missile system is first used in combat.



MLRS in Combat
February 1991

The Multiple Launch Rocket System (MLRS) is fired for the first time in combat.



Army Aviation in Somalia
1994

Over 60 U.S. Army aircraft and approximately 1,000 aviation personnel operate in Somalia.



Osprey's First Flight
December 1996

The V-22 Osprey, the first of the EMD (engineering and manufacturing development) aircraft, accomplishes its first flight.



AMRDEC Established
October 1, 1999

AMRDEC formed by merging AVRDEC (Aviation Research, Development and Engineering Center) and MRDEC (Missile Research, Development and Engineering Center).





2000-Present

During the 2000s

AMRDEC's capabilities have been at the forefront of our nation's efforts in Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF), and have ushered in a new era of aviation and missile technology development and engineering services.

Since 2001, Unmanned Aerial Vehicles (UAVs) have been used for reconnaissance and aerial attack. AMRDEC enhanced this technology by successfully integrating the HELLFIRE missile on the Predator UAV to provide strike capability.

In 2003, the AH-64 Apache carried the 101st Airborne Division into combat in southern Iraq to conduct the first air assault in Operation Iraqi Freedom. This was the longest air assault operation in history, and was performed by utility and heavy lift aircraft, saving numerous lives by evacuating injured Soldiers and conducting aerial command and control during combat operations.

At AMRDEC labs and facilities, current technologies are being upgraded to resolve immediate obsolescence issues, increase performance, reliability and interoperability and extend service life. Cutting edge technologies already in development will provide multi-dimensional support to the Soldier, including greater situational awareness and allow aircraft to fly further and faster and perform in a wider range of environmental conditions while carrying larger payloads.

*Predator Deployed to Afghanistan
October 2001*

The Predator provides intelligence and strike capability to Operation Enduring Freedom.

2000s Staggering Accomplishments



UAVs Deployed
2001
The UAV is used for reconnaissance.

PAM's First Flight
November 2002
The NetFires Precision Attack Missile makes its first autonomous flight.



HELLFIRE UAV Integration
2002
AMRDEC integrates the HELLFIRE missile on the Predator Unmanned Aerial Vehicle.



Patriot PAC-3
March 2003
Two Iraqi missiles are successfully intercepted by Patriot PAC-3 missiles in Kuwait (first day of Iraqi freedom).



Reconnaissance Vehicle System
2007
AMRDEC wins an Army's Greatest Invention award for the Reconnaissance Vehicle System (RECCE).



AMRDEC Accolade
2008
AMRDEC named Research Lab of the Year



SLAMRAAM Prototype
September 2010
AMRDEC completes a Surface Launched Advanced Medium Range Air-to-Air Missile Launcher (SLAMRAAM) prototype.



Army Begins OH-58D Upgrade
2011
Army begins mission equipment upgrade modifications to the OH-58D to provide improved avionics, sensors and overall performance capabilities for the new OH-58F.



Ballistic Protection Systems (BPS)
2013
AMRDEC's Prototype Integration Facility (PIF) designed and installed a prototype for enhanced Ballistic Protection Systems for the UH-60 Blackhawk.

Soldiers Visit AMRDEC
August 6, 2009
Soldiers from the 82nd Airborne Division visited AMRDEC to learn of current and future projects developed to support them and their comrades.



Guided MLRS
August 2012
The Guided Multiple Launch Rocket System (GMLRS) achieved the farthest range to date after modifications were investigated and instituted by AMRDEC.



Interconnect Anti-Aircraft System Programs
2013
The U.S. Army and Marine Corps decide to interconnect two next generation anti-aircraft system programs: the CLAWS of the Marines, and the SLAMRAAM, Surface-Launched Advanced Medium-Range Air-to-Air Missile of the Army.

Leadership

AMRDEC's vision is to be the world leader in aviation and missile technologies, life cycle systems engineering and integration for America's Warfighter; and to rapidly provide the Warfighter with deployable, flexible, lethal weapons systems and platforms that significantly improve force effectiveness and survivability.

Throughout the years, AMRDEC leadership has provided the guidance and advocacy required to fulfill this vision. Under superior guidance, AMRDEC has evolved into an international leader in aviation and missile technology.

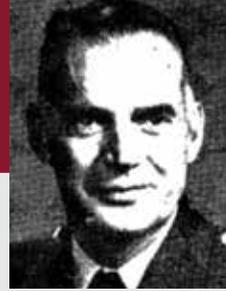
The gentlemen included here have held leadership positions in the Army's aviation and missile research, development and engineering organizations that have evolved into the current AMRDEC.

The AMRDEC Mission

Deliver collaborative and innovative technical capabilities for responsive and cost-effective research, product development and life-cycle systems engineering solutions.



Maj. Gen. Francis McMorrow
1962 – 1963



COL Raymond W. Burkett
1962 – 1963



COL Daniel F. Shepherd
1963 – 1964



COL Stanton W. Josephson
1964 – 1965



COL Robert M. Pearce
1965 – 1966



COL Nils M. Bengtson
1967 – 1969



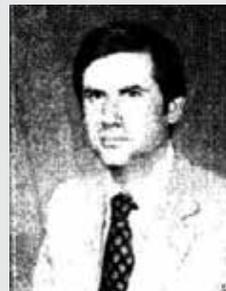
William H. Brabson, Jr.
1969



Dr. John McDaniel
1970 – 1977



COL J.C. Geary
1972 – 1975



Richard B. Lewis II
1974 – 1983



Dr. Julian Kobler
1977 – 1979



Charles H. McKinley
1978 – 1979



Dr. William C. McCorkle, Jr.
1980 – 2009



Charles C. Crawford Jr.
1983 – 1988



Thomas L. House
1990 – 1996



Eric F. Edwards
2010 – 2014

Workforce Excellence

Across AMRDEC, there are 3,109 men and women committed to technical excellence and unsurpassed services to their ultimate customer – the U.S. Soldier.

Throughout the organization's history, AMRDEC's workforce has answered the Army's call to improve survivability, reliability, sustainability and lethality. Over the years, the missions have changed, but the focus has always been and will continue to be on the Soldier. The employees of AMRDEC continue to work to make positive contributions to our Soldiers, community and nation by bringing the best technology to the Warfighter.



Husky Mark III, 2G 2-Seat Prototype



Unmanned Aircraft System Shadow 200 Communications Relay System



Humvee Crew Extraction D-Ring



Reconnaissance Vehicle System



Integrated Robotic Explosive Detection System

Awards

Since 1976, AMRDEC has received 29 Awards for Excellence from the Department of the Army, including being named the Army's Research and Development Laboratory of the Year an unprecedented nine times. The annual award program evaluates Army laboratories on their accomplishments in research, development, management and on contributions to the Warfighter.

AMRDEC has also won the Army Superior Unit Award, 9 Department of Defense (DoD) Value Engineering (VE) Best Field Command Awards, 8 DoD VE Professional Awards, and 5 DoD Best Individual/Team Awards.

AMRDEC is the eight time winner of the Army's Greatest Invention Award, which is voted on by Soldiers, giving it the nickname the "Soldier's Choice Award." In 2013, AMRDEC was given an award by the Economic Development Partnership of Alabama for its role in helping create high-wage jobs for Alabamians.

Patents

The AMRDEC technology portfolio includes approximately 53 active and pending patents. At the McMorro Laboratories, one of the first patents was issued in January 1958 to inventor Oscar C. Holderer. His invention dealt with gate valve arrangement for use in fluid flow lines. Since then, tens of thousands of products have been developed by the Army and patented. The Army has advanced applications in structures, aeromechanics, survivability, and engines/transmissions. The missile technology has advanced in composite structures and materials, computer hardware/software technology, energetics and warheads, guidance, navigation and control, image and signal processing, optical, infrared, radio frequency, and micro-electro-mechanical sensors, and propulsion technology.

Recognition

AMRDEC serves as the DoD lead for Rotorcraft Science and Technology (S&T) and the DoD lead for Gel Propellants. **AMRDEC, as of April 2000, was one of the few Capability Maturity Model (CMM) Level 4 software engineering facilities in the Army and is currently working towards a Level 3 Capability Maturity Model-Integrated (CMMI) for Development.** The Directorate of Aviation Engineering is the Airworthiness authority for Army-developed aircraft. In addition, enormous capability is provided by the AMRDEC Prototype Integration Facility (PIF) which has quickly become "The Army's Premier Rapid Response Organization."

Limitless Possibilities

AMRDEC provides state of the art technology for our Warfighters, developing what was once unimaginable. AMRDEC is breaking new ground with kinetic energy weapons, active protection systems, and achieving breakthroughs in new missile materials, motors, propellants, and energetics.

The vision for aviation in 2050 is improved and advanced technology to include future unmanned systems at the hand held unit level, air crews with more situational awareness, vertical lift aircraft with the ability to carry heavier payloads and go further and faster. Medevac requests will be relayed through an on-station unmanned aerial system, so that medical staff can review patient information and coordinate medical activities while the aircraft is enroute.



The vision for missile solutions includes increased accuracy, lethality, and mobility. One of the most important things to a Soldier is his confidence in his weapon. AMRDEC's continued dedication builds that confidence and allows a Soldier to accomplish his mission.

Where there is a need, our scientists and engineers deliver a solution. It is a tradition that will continue for many years to come.

Staggering accomplishments, limitless possibilities.

Fostering innovation and accelerating / maturing technology to enable Future Force capabilities while exploiting opportunities to rapidly transition technology to the Current Force

Science & Technology Programs

- Missile Seekers
- Rocket and Turbine Propulsion
- Counter RAM (Future)
- Vehicle Active Protection
- Target Acquisition Systems
- Precision Guidance Systems
- Aerodynamics and Structures
- Rotorcraft Drives and Controls
- Platform and Weapons Systems Integration
- Aviation and Missile Condition Based Maintenance
- Manufacturing Technology
- AMCOM Corrosion Program
- Navigation Systems

Engineering Services

- Life Cycle Systems Engineering
- Software Engineering - Accredited Level 4 CMM
- High-Fidelity System Level Simulations
- Independent Product / Process Assessment
- Airworthiness Qualification and Release Authority
- Sustainment Engineering Support
- Rapid Prototype Engineering / Integration
- Production / Quality / Reliability Engineering
- AMCOM Corrosion Program
- Technical / Acquisition Management



HELLFIRE MOD K Missile for Predator



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McMorrow 50th Anniversary Microsite:
<http://www.redstone.army.mil/amrdec/50th/index.html>

