MITRE is a not-for-profit corporation that has one core business—to operate federally funded research and development centers (FFRDCs).

- National Security Engineering Center
- Center for Advanced Aviation System Development
- Center for Enterprise Modernization
- Homeland Security Systems Engineering and Development Institute
- Judiciary Engineering and Modernization Center
- CMS Alliance to Modernize Healthcare
- National Cybersecurity FFRDC

**Mission Statement**

One public interest company, working with industry and academia to advance and apply science, technology, systems engineering, and strategy, enabling government and the private sector to make better decisions and implement solutions to complex challenges of national and global significance.
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Solving Multiple Challenges

A solution developed for one specific challenge often results in a wide range of benefits elsewhere.

Sharing Our Research

As the operator of federally funded research and development centers, MITRE disseminates its research for the national interest.

MITRE at a Glance

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This past year differed from 2013 in many ways. On the positive side, the U.S. economy rebounded strongly. Interest rates remained low, and employment rates began climbing. Despite contentious mid-term elections, our leaders avoided the government shutdown and sequestration cuts of the previous year.

On the other hand, turmoil in the Middle East, civil rights protests around the world, the Ebola crisis, escalating cyber threats, and financial instability in Europe and beyond remind us that many complex challenges still exist. Few of these problems exist in isolation; most reach across both government and national boundaries.

Meeting these challenges demands solutions that cross boundaries as well. As an operator of multiple federally funded research and development centers, MITRE has a unique vantage point that enables us to respond to issues that cut across organizational barriers. Working horizontally across our sponsor organizations, we can apply solutions developed for one sponsor to benefit the whole of government. Equally important, we are uniquely positioned to serve as a catalyst and hub for collaboration among disparate organizations—government, academia, and industry—to address complex problems.

In 2014, this cross-cutting strategy yielded wide-reaching results. For example, a successful MITRE program aimed at improving aviation safety inspired a new initiative in healthcare, the National Patient Safety Partnership, which uses big-data analytics to address the life-threatening problem of medical errors in hospitals.

Information—getting it, understanding it, and sharing it—continues to be of utmost importance to our government sponsors. MITRE plays a key role in the Department of Defense’s Joint Information Environment, which seeks to transform the Department’s information infrastructure. JIE recently began a successful rollout that will increase bandwidth, improve network security, and avoid as much as $1 billion in future costs.

With an eye toward the needs of both civilian and military sponsors, we develop technologies that benefit both. Recently, for example, MITRE’s computer vision experts developed breakthrough technologies that sift for crucial clues through massive quantities of video footage at lightning speed, and our independent R&D program introduced prototype smartphone software that creates on-the-fly communications networks when standard infrastructure fails—boons to both first responders and warfighters.

MITRE has long been recognized as a thought leader in aviation and cybersecurity, and we continue to increase our impact in both areas. In June, we signed an agreement with the Civil Aviation Authority of Singapore to open MITRE Asia Pacific Singapore. This facility will provide a growing regional aviation community with laboratory and simulation tools currently available only in the United States.
And in the fall of 2014, the National Institute of Standards and Technology selected MITRE to operate its National Cybersecurity FFRDC, the first FFRDC dedicated solely to cybersecurity. We are committed to helping NIST in its goal of accelerating the adoption of secure technologies to combat cyber threats.

These examples, and those in the following pages, offer a glimpse of MITRE’s work and results. We could not have achieved any of this without the talent, creativity, and dedication of our staff, for which we are grateful. We are equally appreciative of the continuing support, guidance, and insights of our Board of Trustees. This year, we say goodbye to Gen. Ronald R. Fogleman (USAF Ret.) and wish him well in his future endeavors. We also welcome three new members, Gen. C. Robert Kehler (USAF Ret.), Mr. David G. Fubini, and Mr. George C. Halvorson. In March 2014, we mourned the passing of our chairman, Dr. James Schlesinger; we will always be thankful for his many contributions to MITRE and to our nation. As this report was nearing completion, we were saddened to learn of the passing of Dr. Jack P. Ruina, who served for many years on our board.

As we move through our sixth decade of public service, we hold firm to our values of commitment, collaboration, technical excellence, and integrity. No matter what complex challenges our nation faces, we stand ready to help our sponsors achieve mission success.
MITRE is different.

We serve as a bridge between government agencies and also as a channel for them to collaborate with industry and academia.

Because we operate seven different FFRDCs, our customers reap the benefits of research and expertise that cuts across our entire organization.

In the following pages, we invite you to see examples of how our customers benefit from our cross-cutting work.
The Rewards of Collaboration

By bringing together the right mix of stakeholders for the given situation, MITRE facilitates the problem-solving process.

“NextGen is a complex, multifaceted undertaking for us and the aviation community. With great clarity, MITRE took a comprehensive view across NextGen and made useful recommendations. MITRE applied their considerable knowledge of both technology and FAA operations and our mission to this valuable assessment. We will use MITRE’s recommendations in refining our plans for moving forward in a challenging environment.”

– Edward L. Bolton, Jr., Assistant Administrator for NextGen, Federal Aviation Administration
Helping Unmanned Aircraft “See and Avoid”

How will it be possible for unmanned aircraft to fly safely in our nation’s crowded skies? MITRE helped develop a new system recently approved by the FAA that enables a remote pilot to “see and avoid.”

In the coming years, the national airspace will serve an increasing number and variety of unmanned aircraft operated by remote pilots. Current Federal Aviation Administration regulations stipulate that all pilots have a responsibility to “see and avoid” other aircraft. Until recently, this meant that a remotely piloted aircraft could operate in the national airspace either within visual range of the pilot or within visual range of observers, typically on the ground or in a trailing aircraft. Neither option enables the widespread operation and application of remotely piloted aircraft in the National Airspace System.

Improving the View

A new Ground-Based Sense and Avoid capability, which MITRE helped develop, builds on existing ground-based radars to detect airborne traffic and on existing air traffic control systems to display traffic and conflict advisory information to the unmanned aircraft pilot.

MITRE’s cross-cutting team of systems engineers, safety analysts, and other experts collaborated with the U.S. Air Force, the Volpe National Transportation Center, MIT Lincoln Laboratory, and Raytheon in designing, implementing, and testing the Ground-Based Sense and Avoid capability.

A Celebration at Cannon

The Air Force recently received an FAA Certificate of Waiver or Authorization, the first of its kind, to operate specific remotely piloted aircraft using this capability at Cannon Air Force Base in New Mexico.

In April 2014, the Air Force, MITRE, and other partners celebrated the first flight of remotely piloted aircraft beyond visual range of the pilot and without other observers. In its first hundred days, the Ground-Based Sense and Avoid system at Cannon supported more than 70 sorties, enabling a 24/7 training schedule not possible or cost effective with ground observer or chase plane operations. The Air Force now plans to implement the system at other locations.
To strengthen our nation’s cybersecurity and protect national information systems, the National Institute of Standards and Technology established the National Cybersecurity FFRDC last October. The new federally funded research and development center will be operated by MITRE and the University System of Maryland (USM).

State-of-the-Art Laboratory
The new FFRDC—the first solely dedicated to cybersecurity—will support the National Cybersecurity Center of Excellence, which helps businesses secure their data and digital infrastructure by bringing together information security experts from industry, government, and academia. Located in Rockville, Maryland, the National Cybersecurity Center of Excellence was created in 2012 by the National Institute of Standards and Technology, the state of Maryland, and Maryland’s Montgomery County.

A state-of-the-art cybersecurity research lab enables the National Cybersecurity Center of Excellence to tackle the leading cybersecurity challenges. MITRE will provide research, development, engineering, and technical support, as well as operations and facilities planning.

Good Partners
MITRE will partner with two leading research institutions within the University System of Maryland—the University of Maryland, College Park, and the University of Maryland, Baltimore County—to operate the new FFRDC. Faculty, staff, and students from these institutions will help support the work.
As part of our public interest mission, MITRE brings together academic institutions, commercial vendors, and government to advance new concepts, standards, and solutions in cybersecurity awareness, resiliency, and threat-based defense. We have worked with federal agencies for more than four decades to secure the country’s critical infrastructure, including information-based as well as physical entities.
The Federal Aviation Administration commissioned MITRE to perform an independent assessment of its efforts to modernize the nation’s air traffic management system.

In 2005, the FAA launched the Next Generation Air Transportation System (NextGen), a 20-year initiative to modernize and transform the nation’s air traffic management system to improve the safety and efficiency of air travel. This extensive undertaking touches all aspects of air traffic management and operations.

**An Evolving Environment**

Much has changed since NextGen’s launch—including evolving airspace user needs, new budget constraints, technological developments, and unmanned aircraft and commercial space vehicles seeking access to the national airspace. In light of these and other changes, the agency asked MITRE to assess the program’s progress and provide recommendations for the path forward.

*NextGen Independent Assessment and Recommendations*, which was completed in October, confirms that the FAA has made considerable progress with the modernization of the National Airspace System infrastructure. It also emphasizes that the benefits of deployed NextGen operational capabilities have not yet been fully realized.

As an example of progress on the infrastructure, the FAA has implemented its ground network for a surveillance system based on aircraft broadcasting their own positions. Known as Automatic Dependent Surveillance-Broadcast, or ADS-B, this new system will enable many future air traffic management efficiency improvements.

**Defining Realistic Expectations**

The assessment also identifies challenges to achieving the NextGen vision and offers recommendations for how to address them. For example, MITRE recommended the FAA strengthen its efforts...
to ensure that members of the aviation community equip their aircraft with ADS-B. Another recommendation addresses how to best accommodate unmanned aircraft and commercial space vehicles.

The FAA accepted MITRE’s recommendations and has already begun acting on many of them. To see “NextGen Independent Assessment and Recommendations,” visit www.mitre.org and search for the title.
When Uncle Sam Takes Attendance

With the cost doubling for each successive census in recent decades, the Census Bureau wants to try a new approach. They turned to MITRE to stage a full-scale simulation that allowed them to test different concepts.

In 1790, Congress ordered that the population of our growing country be counted every 10 years. The current process—each resident completes and returns a survey—has been in place since 1960. To locate and count those who don’t respond, the Census Bureau sends out “enumerators” to help ensure that representation and remuneration are fairly divided among our 50 states.

As the country’s population grew, so did the cost of counting it. Congress has made it clear—and the Census Bureau agrees—that the cost increases are unsustainable. With that in mind, the bureau sought ways to mitigate factors that would make the 2020 Census the most expensive ever. One major innovation area involves re-engineering field operations and using technology to more efficiently and effectively manage the 2020 Census fieldwork. These design changes have the potential to save the Census Bureau $2.3 billion.

**Counting on MITRE to Simulate Options**

After initial development, the Census Bureau needed to test these new devices, applications, and control systems. Working with MITRE’s Center for Enterprise Modernization, the agency staged a full-scale simulation based at MITRE’s National Simulation and Experimentation Laboratory. The lab, which began as a U.S. Navy testing effort and began supporting joint services in the early 2000s, has expanded its scope to test systems involving military operations, homeland security, and now, the U.S. Census.

Following six months of scenario development, the simulation event took place over five days and involved dozens of stakeholders. The simulation tested a workload management system using a database...
populated with synthetic data. Though these simulations won’t completely replace a field test, the Census Bureau can use the information gathered at the event to derive greater value from its field operations. The event also allowed the Census Bureau to see untested concepts in action before committing to them financially, which should lead to additional savings in 2020.
Helping Courts Embrace Technology

Elizabeth Rindskopf Parker, a nationally recognized legal scholar and member of the MITRE Board of Trustees, works closely with our Judiciary Engineering and Modernization Center.

Can you describe MITRE’s role in modernizing the legal system?
The legal system has begun to recognize that it can no longer avoid information technology. MITRE is playing a key leadership role in helping court systems embrace technology. It’s a vitally important task that no one is better prepared to help accomplish.

What is MITRE’s strength in this area?
MITRE’s expertise in systems integration, which is essential to modernizing the judiciary, offers great potential for all judicial systems. Equally, MITRE’s leadership in big data analytics is positioned to play an important part in the legal system’s evolution.

Can you talk about the collaborative nature of this work?
MITRE’s role as a catalyst requires that it be both nimble and nuanced to most effectively introduce its technical expertise to the legal system and its unique culture.

What will be the impact of judicial modernization?
Information is key to every part of a legal system. Technology and big data analytics have much to contribute, but they will be successful only if fundamental legal principles and culture are respected.
Research That Evolves Into New Solutions

Work performed for one customer can lead to similar solutions for others.

“MITRE is a valued industry partner that provides unbiased systems engineering and enterprise architecture support to Air Mobility Command, helping our staff sustain and improve the highly available, globally distributed IT systems that enable global reach for our nation’s warfighters.”

– Col. Robert Lyman, Air Mobility Command/A6
Every year, thousands of patients suffer injuries or die because of mistakes that could have been prevented. Medication errors, patient alarms that go unattended, and other breaches in care represent the sixth leading cause of death in the country.

MITRE launched the National Patient Safety Partnership to address this critical public health issue. We will safeguard this rich data repository and use powerful analytic tools to identify patterns, trends, and factors that correlate to safety issues. More important, analysts will offer intervention points for preventing future incidents.

Lessons from Aviation Safety

The inspiration for the National Patient Safety Partnership came from the aviation industry. Since 2007, MITRE has served as the trusted steward to safeguard and analyze sensitive aviation industry safety data. In collaboration with the Federal Aviation Administration, MITRE established Aviation Safety Information Analysis and Sharing. This collaboration—which includes airlines, government agencies, and aircraft manufacturers—has led to numerous safety findings and solutions.

The National Patient Safety Partnership is focusing first on pediatric hospitals, where a high level of collaboration already exists that will help encourage the sharing of sensitive data. Its flagship partners include Boston Children’s Hospital, Children’s National Health System in Washington, D.C., and Cincinnati Children’s Hospital Medical Center.

Unknown Safety Risks and Potential Interventions

The National Patient Safety Partnership is conducting several studies focused on medication management and alarm management. The partners have sent the relevant data to MITRE and are working in teams to identify previously unknown safety risks and potential interventions.

Looking ahead, the partnership plans to add more pediatric hospitals and then expand to other types of hospitals with the goal of addressing an even broader range of health industry challenges.
Ninety percent of all existing pixels were created in the last five years. MITRE’s computer vision group has developed algorithms to enable computers to scan millions of frames of video to identify pertinent information.

How long do you think it would take to view one day of video footage from a medium-sized company’s security cameras? A week? A month? In fact, it would take a year—and, chances are, you wouldn’t find anything noteworthy.

But what if a car approached a secure area on your premises at 3 a.m.? Wouldn’t it be helpful if your computer were able to visually scan the perimeter, detect anomalous activities, and offer a brief video summary of events?

Computers That “See”

MITRE’s computer vision group has found a way to do just that. The solution is based on a new branch of artificial intelligence known as computer vision, which employs algorithms to extract information from visual data—images, video, 3-D scans, infrared—and enables a computer to “see.”

MITRE’s Content-Based Retrieval and Access program can scan millions of frames of video and identify specific objects and events of interest. It then assembles a brief summary using video stabilization and tracking algorithms to recognize motion and employs object detection/classification techniques to analyze the scene’s 3-D structure.

Another MITRE program named Holodeck was inspired by the Boston Marathon bombing when law enforcement officials faced the enormous task of looking for clues in cellphone, ATM, and security videos. Wearing an Oculus Rift virtual reality headset, users enter Holodeck’s immersive re-creation of the original scene. Instead of browsing through hundreds of individual videos of a specific setting one at a time, users can either take a bird’s-eye view of a location or play any of the videos from a specific vantage point.
Visual Data Triage

Think of computer vision technologies as data triage. By sorting through massive visual files in a tenth of the time it would otherwise take, it enables people to accomplish work in minutes instead of hours.
Improving the Well-Being of Veterans

MITRE conducted an in-depth study in collaboration with the Veterans Health Administration that will contribute to improving the health, satisfaction, and well-being of veterans, while also making services more cost effective.

While the demographics of our veterans continue to shift, one factor is all too common. From the youngest to the oldest veterans enrolled with the Veterans Health Administration, a large number suffer from complex physical and emotional trauma.

The traditional “diseased-based” healthcare model can be demanding for these veterans. For many post-9/11 veterans who live far away in rural or underserved areas, it’s particularly challenging to access regular care.

Improving Quality of Care
The VA Healthcare Modernization Study supported by MITRE resulted in nine recommendations for creating a system that more efficiently delivers better access and better outcomes. As well as studying existing veteran interviews, MITRE’s six-person team collaborated with more than 55 experts, including physicians, nurses, medical directors, chief financial officers, executive directors for health affairs, and senior VHA leaders, to develop specific recommendations.

The resulting VA Healthcare Modernization Report includes steps for achieving efficiencies, such as standardized physical healthcare delivery structures and best practices for procuring equipment and pharmaceuticals as well as leveraging prime vendor contracts. And to improve quality of care, the VHA is considering a variety of options such as personalized health plans and specific programs tailored to veterans who are at most risk of hospitalization.

Improving Access to Care
To improve access to care for veterans living in rural areas, the VHA may offer local care through non-VHA providers. The VHA is also
exploring the use of virtual technologies for home use, such as remote monitoring and video teleconferencing.

MITRE and the VHA completed the study in spring 2014. MITRE also helped incorporate many of the study recommendations and findings into the VHA’s Blueprint for Excellence, which the Secretary of Veterans Affairs, Robert McDonald, published and provided on the VHA website.
When Time Is of the Essence

The ongoing operation of many of our digital systems depends on the accuracy of our Global Positioning System. MITRE experts developed a system to defend the GPS signal from adversaries who attempt to disrupt it by introducing an imposter signal.

A wide range of modern digital systems—including defense, infrastructure, financial, and others—rely on a precision time source for their operations. These systems depend on the Global Positioning System (GPS), a space-based satellite navigation system, because it broadcasts an extremely accurate time signal.

Should adversaries puzzle out a method for degrading the accuracy of the GPS signal, they could potentially throw a wrench into systems that allow us to communicate, navigate, conduct business, and protect the nation. In light of this threat, MITRE gathered resources and experts from across our organization to design and prototype the Time Anomaly Detection Appliqué, a system to detect and mitigate a particular class of GPS threat: the “spoofing” attack.

Imposter Signals

These attacks work by tricking a GPS receiver into locking onto a falsified version of the GPS signal. Once the receiver has locked onto a false signal, the signal gradually phases out of synchronization with the GPS signal. The incremental phase-out makes the attack very difficult to detect.

Time Anomaly Detection Appliqué is designed to provide a cost-effective, reliable, and easy-to-use method for protecting GPS receivers from spoofing attacks. It defends against spoofing by continuously comparing a trusted input—for example, a known frequency or location—with those provided by the GPS receiver. When the system detects a difference between these two inputs, it alerts the user to the suspected imposter signal.
The Next Stage
The next stage of development for this technology focuses on a capability not only to detect spoofing attacks, but also to mitigate the effects and pinpoint their origin. MITRE is working with sponsors and commercial vendors on pilot plans for commercializing this type of monitoring solution.

Time Anomaly Detection Appliqué is available for licensing through MITRE’s Technology Transfer Office.
What is the main focus of MITRE’s cybersecurity work? Cybersecurity extends across a wide range of domains, including technology, policy and law, human behavior, and others. Our engineers, analysts, and scientists work to advance systems security engineering and to strengthen the defense of our nation’s IT and physical systems.

How does MITRE work with the government in cybersecurity? We partner with government leaders and organizations to address their cyber challenges involving strategy, engineering, analysis, and integrating commercial and custom solutions. Since we operate multiple FFRDCs, we’re able to share solutions and results across government customers as well as with our industry peers.

What is the current leading challenge in cybersecurity? The ingenuity and adaptability of the cyber threat actors continue to be one of the biggest challenges. The vast amount of personal and organizational information easily available on the Internet makes it possible for them to blend cyber attack techniques with behavioral manipulation.

How has cybersecurity strategy evolved in recent years? As cyber attacks continue to grow, MITRE and many other organizations pursue an increasingly active cyber defense. At the same time, we focus on a resilient IT and physical infrastructure. It’s a strategy of detection and response balanced with risk mitigation.
Solving Multiple Challenges

A solution developed for one specific challenge often results in a wide range of benefits elsewhere.

“By bringing together the experience and expertise in air traffic management from our two organizations and partners, we are confident that this collaboration, under the ambit of the wider Center of Excellence for ATM in Singapore, will present significant value to the Asia Pacific region in addressing its distinct aviation challenges. MITRE Asia Pacific Singapore will also facilitate ATM-related research, development, and technology transfer for Singapore and the Asia Pacific.”

– Mr. Yap Ong Heng, Director-General, Civil Aviation Authority of Singapore
A wide variety of new spacecraft will soon enter the National Airspace System—vehicles with flight profiles, missions, and capabilities vastly different from the rockets NASA has been launching since the 1950s. To safely and efficiently accommodate commercial space flights, the Federal Aviation Administration enlisted MITRE’s help.

Working with a Variety of Stakeholders
MITRE already works with the wide range of organizations on whose shoulders the management of new launch and reentry vehicles will fall, including the FAA, the Department of Defense, civilian agencies, and—through the FAA—the commercial space industry. With these stakeholders, MITRE currently helps develop standardized systems, policies, and procedures, with the goal of integrating commercial space flight into our nation’s airspace.

As part of this effort, MITRE built a computer model to assess the impact of proposed spacecraft operations on aircraft already flying in our nation’s airspace. The model can determine the number of aviation flights likely to be affected by a commercial space launch or reentry operation. It also provides decision-support information, such as identifying which launch and recovery times would have the least impact on aviation.

Tracking Commercial Spacecraft
Due to their excessive speeds and altitudes, commercial spacecraft are difficult for FAA radar to track. The FAA asked MITRE to evaluate alternative surveillance technologies, and Automatic Dependent Surveillance-Broadcast shows the most promise.

A MITRE-developed prototype of a small and lightweight version of this system—the Universal Access Transceiver Beacon Radio—has been tested successfully on a variety of commercial and government spacecraft. This technology may provide the foundation for future surveillance technologies to track commercial space flights.

If the commercial space industry takes off as experts predict, our nation’s crowded airspace will get even more crowded. MITRE is helping develop new technology and procedures to safely and efficiently accommodate the new spacecraft.
The DoD is undergoing a massive IT transformation known as the Joint Information Environment. MITRE is contributing to a variety of projects that will provide better access to information, strengthen cybersecurity, and reduce costs by billions of dollars.

The value of information technology to the warfighter would be difficult to overestimate. The right information—at the right time—is as important as any weapon. In fact, information technology now ranks as a core warfighting capability.

Silos of Information

Until recently, the Department of Defense had to deal with hundreds of data centers, thousands of operational systems, and more than seven million computers and devices. Because different agencies built their own IT capabilities over time to meet local needs, many "silos" of information exist within the department.

Consider warfighters who want to talk with a stateside intelligence expert about a particular threat. If they encounter a wall of network silos while trying to find that person, they may be forced to make decisions without information that could have made a difference. That can cost lives.

The Joint Information Environment will modernize capabilities across the Department of Defense. The most recent key component of the IT initiative rolled out in early 2015 in San Antonio and in locations in Europe. The deployment involved a set of joint regional security stacks that consist of servers and switches used to improve network security.

Saving More Than $1 Billion

MITRE has contributed to multiple projects related to the Joint Information Environment. This includes supporting a complete reorganization of the DoD Email Enterprise system. We also led a study to compare the Navy’s Next Generation Enterprise Network
functions and capabilities with the Joint Information Environment.

Another project involved deploying key technologies for boosting bandwidth necessary for enterprise-level systems to replace network silos with a common IT framework. According to the American Forces Press Service, these technologies, which play a vital role in an agreement involving the Army, the Air Force, and the Defense Information Systems Agency, will result in cost savings of more than $1 billion.
As the Department of Defense prepares to purchase a new electronic healthcare records system, MITRE plays a key role in supporting the acquisition.

Soldiers, sailors, airmen, and marines used to physically carry their medical records with them from one location to another. This changed in the 1980s when the military adopted an electronic healthcare records system. As this legacy system continues to age, however, the Department of Defense plans to soon acquire a new electronic healthcare records system.

**A Multibillion-Dollar Acquisition**

To help procure its new electronic healthcare records system, the Department of Defense called on MITRE. Based on the advanced solutions available in the marketplace, the military decided to pursue an off-the-shelf and open architecture that would not restrict it to a specific vendor.

The new system, Defense Healthcare Management Systems Modernization, will be a multibillion-dollar acquisition with a 10-year contract. It will feature the latest advances in electronic healthcare records technology: clinical decision support for providers, robust billing engines, and the ability to synchronize ancillary services like pharmacology, laboratory tests, and radiology.

**Preparations Before, Transitions After**

MITRE assisted the military in defining the capabilities that the new system would have to meet. On August 25, 2014, the Department of Defense issued a request for proposals for an electronic healthcare records system. As the military prepares to adopt its new electronic healthcare records system, MITRE will apply its systems-of-systems expertise to help with the transition.
MITRE is also assisting in adopting and maintaining health data standards. The new system will ensure that the Department of Defense, the Department of Veterans Affairs, and private care providers can effectively exchange patient healthcare information. As the military healthcare system marches away from its paper-based past, MITRE will help the military to transition smoothly from the old system to the new.
Building a New Research Lab in Singapore

In collaboration with the Civil Aviation Authority of Singapore, MITRE is developing a new lab that focuses on the Asia Pacific region’s air traffic management needs.

In June, MITRE signed a 10-year contract with the Civil Aviation Authority of Singapore (CAAS) to establish an office and advanced technology research laboratory focused on air traffic management. Slated to open in June 2015, the facility will be located in Singapore.

First of Its Kind

Air traffic in the Asia Pacific region is expected to triple by 2030. This first-of-its-kind facility—known as MITRE Asia Pacific Singapore—will help the region adapt to the rapidly accelerating demand. By introducing new aviation technologies and procedures, the facility will enable the city-state and its neighbors to maintain high levels of air safety and service.

As our first aviation research and development center located outside the United States, the laboratory will facilitate a long-term program of research, development, and technology transfer. The 10,000-square-foot facility will feature MITRE-developed real- and fast-time simulation tools. These include cockpit simulators, a wrap-around tower, en route and terminal controller workstations, and advanced traffic-flow management tools.

A Collaborative Environment

The initial focus of the new office and lab will be on air traffic management. However, the integrated facility will also be able to easily and securely connect to other organizations’ research simulation capabilities. The ultimate goal is to create a collaborative environment for governments, industry, and academia to conduct joint research and analysis on a variety of global challenges.
Can you describe your work as an international portfolio director?
I’m responsible for addressing challenges that face the aviation community—air navigation service providers, civil aviation authorities, airports, and airlines—in Asia Pacific, the Middle East, Africa, and Canada. This involves working across MITRE to find the experts or the technology that can deliver solutions.

How does this global reach fit into MITRE’s role as an operator of FFRDCs?
The Center for Advanced Aviation System Development, a federally funded research and development center that we operate for the FAA, plays a key role in supporting the agency’s work in developing international aviation standards, technologies, and operations. This absolutely requires a global reach.

What are some examples?
We have a number of examples. In Dubai, we’re developing new aircraft routes for Dubai International Airport. In Singapore, we’re establishing an advanced technology laboratory focused on air traffic management. In India, we created a plan that outlines the specifications for a technical center at Begumpet Airport in Hyderabad.

Can you elaborate on the impact of these global partnerships?
Whether it’s aviation, cybersecurity, or defense systems, global relationships are crucial. Expanding our partnerships around the world is one of the best ways we can serve our customers in the U.S. government.
Sharing Our Research

As the operator of federally funded research and development centers, MITRE disseminates its research for the national interest.

“MITRE’s phenomenal efforts in re-engineering the DoD Blast Injury Prevention Standards Recommendation Process have significantly enhanced process efficiency, dramatically reducing the time required to identify standards for developing the very best blast injury prevention strategies for our nation’s warriors. I appreciate the enthusiasm the MITRE team brings to this critically important process.”

– Mr. Michael J. Leggieri, Jr., Director, DoD Blast Injury Research Program Coordinating Office, U.S. Army Medical Research and Materiel Command
At our Princeton University laboratories, MITRE researchers work with nature at its smallest scale to better understand applications of quantum mechanics. Advances in the still-emerging field of quantum information sciences have the potential to deliver exponentially faster computational speed, compared with current computing, as well as the highest sensor and image resolution imaginable.

Collaborating with Colleagues
This year MITRE researchers received additional government funding to continue their progress building prototype systems for quantum computing, sensing, and communications. Most recently, this work has produced a breakthrough—photonic quantum memory for computing.

Our theoretical and experimental physicists seek ways to ameliorate the effects of “noise” that degrades quantum information in real systems. The objective is faster information processing and higher image resolution than is possible today, even with the most sophisticated technology. Our Princeton location has fostered collaborative work with university colleagues, such as jointly authored publications on quantum error correction.

Real-World Applications
The research team also studied applications to practical problem solving. For example, quantum computers will allow us to process large amounts of data, enabling real-time analysis of frequency-hopped spread-spectrum communications, detection and analysis of embedded messages, and other computationally intensive problems. Quantum computing will make it possible to break enemy codes, and quantum cryptography can ensure that our government’s codes are unbreakable.

Quantum information sciences will revolutionize sensing, communication, and computing capabilities across many domains. In collaboration with the work of others, MITRE’s research will generate benefits beyond defense and intelligence, with huge impact for systems that control our power grid, food distribution, air traffic patterns, and even weather forecasting.
Staying Connected If Networks Fail

Operating during disasters and in conflict zones requires dependable communication, even in the absence of dependable networks. A MITRE application allows equipped smartphones to serve as an on-the-fly network.

What if the armed forces could use smartphones as a low-cost communication tool on the front lines where communication infrastructures can be sketchy or even nonexistent? And what if first responders and private citizens could use their smartphones to create an off-the-grid communication network when natural disasters knock out power and disable cell towers?

When Infrastructure Isn’t Available

MITRE set out to answer these questions when it created Smartphone Ad Hoc Networking. A research team studied a variety of events that destroy or limit communication systems, such as Hurricane Katrina and the tornadoes that hit Moore, Oklahoma, which took down both cell towers and power and telephone lines. With backgrounds in cellular technology, network security, and operating systems, the team designed a networking system that enables smartphones to continue connecting with one another when the existing infrastructure fails to function.

In the absence of cell towers or Wi-Fi access, specially equipped phones can switch into ad hoc mode, creating what’s known as a peer-to-peer mesh network. Smartphone Ad Hoc Networking automatically connects all equipped users within a range of about 800 feet.

As an application and operating system modification, the ad hoc network allows a user to communicate with others who are farther away because of relay points between them. Even better, it allows data to securely travel across a daisy chain of peers in the network to cover great distances.
Available Through Open Source

In May 2014, a MITRE team demonstrated Smartphone Ad Hoc Networking at the Joint Interagency Field Experimentation event at Camp Roberts, California. Our goal is to integrate this networking system into off-the-shelf smartphones so that it’s available at low cost to the military, first responders, and private citizens. To that end, we have made the technology available through open source and plan to transition the technology to government and industry.

Equipped smartphones can form their own off-the-grid network if cellular infrastructures are damaged.
Cyber Intelligence Gets Even Smarter

MITRE cybersecurity experts have developed a powerful new intelligence tool that provides a platform for sharing information about cyber attacks to uncover patterns in an adversary’s targets and techniques.

Faced with sophisticated and relentless attacks, every computer system must constantly defend itself against cyber adversaries. Cybersecurity experts can help, but these experts need an equally elite toolset if they hope to gain an edge on attackers. Now they have one.

CRITs (Collaborative Research into Threats) aggregates, analyzes, and enables sharing of deep technical detail on cyber threats. By capturing data from single, often disparate, cyber attacks, this threat-intelligence platform makes it possible for users to uncover patterns in an adversary’s targets and techniques. It then shares this information with cyber defenders to help them stop the next attack before it occurs, instead of having to react after an attack.

Cross-Company Collaboration

CRITs grew out of work by MITRE cybersecurity experts to better protect our own information technology network. They took a simple malware database used to store threat intelligence and expanded it to include many more types of data from different sources. As different groups across MITRE began using the approach, more ideas filtered in and led to new and improved analytic capabilities.

After proving its effectiveness inside MITRE, CRITs made its public debut when the Advanced Cyber Security Center implemented it in 2011. Based in Boston, the nonprofit consortium of 27 industry, university, and government organizations was established to address the most advanced cyber threats.
Available Through Open Source

In summer 2014, MITRE made CRITs accessible to organizations everywhere by releasing it to the open source community. It’s now available at no charge on GitHub, the popular online platform for code sharing. Prior to the open source launch, MITRE had already licensed CRITs to more than a hundred organizations worldwide. MITRE recently joined forces with Confer, an IT company based in Waltham, Massachusetts, to provide support and integration services to users.
Turning Innovation Into Products

Barry Costa is director of MITRE’s Technology Transfer Office, which was established in 1999 to support technology transfer activities and administer intellectual property management policies and procedures.

What does “technology transfer” refer to?
Technology transfer is the process through which we license MITRE intellectual property—such as new technologies or processes—to non-U.S. government organizations, both in the public and private sector.

Why is it important?
We want our innovations, which are funded by the government, to quickly turn into products that will meet their needs as soon as possible. We license our inventions as appropriate to commercial companies or to the public through open source licenses. This helps create new products, new jobs, and new companies, which all contribute to the national economy and bring commercial products to the market that help our customers.

How does the process actually take place?
We work closely with our legal office on patenting and licensing. In 2014, we filed 14 patent applications, and 12 new patents were issued for MITRE technologies. We also signed 89 licensing agreements, most in direct support of our government customers or, in some cases, academic organizations. The remainder were commercial use licenses.

Are there recent examples you want to highlight?
This year we posted our first app to the Apple App Store. It’s called “BrainKit: TaskPlanner,” and it’s designed to help people with brain injuries accomplish their daily activities. We also transferred several cybersecurity tools to the private sector, which will help better protect critical infrastructure.

For more information about MITRE’s Technology Transfer Office, visit www.mitre.org.
MITRE
at a Glance
In March 2014, we joined the nation in mourning the loss of Dr. James R. Schlesinger. In addition to serving his country with integrity and distinction under three presidents, he presided as our chairman for over two decades. His intelligence, imagination, and commitment to public service will be missed.

In recognition of Dr. Schlesinger’s life and legacy, we plan to dedicate a new building on our McLean, Virginia, campus in his honor.

We will always be thankful for Dr. Schlesinger’s many contributions to MITRE and to our nation.
Notable News

- MITRE released runwaySimulator for conducting rapid analysis of airport capacity. MITRE developed the simulation model through our internal R&D program and transferred the technology to the Federal Aviation Administration. The FAA is now making runwaySimulator available to aviation and airport planning analysts and organizations.

- In partnership with MIT Lincoln Laboratory, MITRE serves as the technical direction agent for the Missile Defense Agency’s Ground-based Midcourse Defense Joint Program Office.

- As part of the Border Enforcement Analytics Program team, MITRE was awarded the Department of Homeland Security Science & Technology Directorate’s Under Secretary’s Award for Building Partnerships.

- The Air Force Materiel Command named the Cursor on Target project office, which includes MITRE support, as the recipient of the Gen. Edwin W. Rawlings Team Award in recognition of a team that significantly improves communications and information support to the Air Force and Department of Defense operations.

- A MITRE project titled “Full Motion Video Optical Navigation Targeting” received the Dynamite Award for Most Disruptive Technology at the American Council for Technology and Industry Advisory Council’s Institute for Innovation 2014 Igniting Innovation Awards.

- MITRE signed a commercialization agreement with Allied Minds to speed the pace of emerging technologies to market by developing a new process for the smooth and efficient transfer of leading technologies to the commercial marketplace. This public–private partnership helps MITRE fulfill our mission to support innovation in the public interest.

- MITRE formalized our partnership with Dubai Air Navigation Services during the World ATM Congress 2014 in Madrid to continue developing innovative and enduring solutions for the complex aviation infrastructure and air traffic management challenges facing Dubai.

- MITRE’s Huntsville, Alabama, site received the 2014 James S. Cogswell Outstanding Industrial Security Achievement Award—the Defense Security Service’s highest honor in the cleared U.S. defense industry. Of the nation’s more than 13,300 cleared contractors, less than 1 percent are selected for the award.
· MITRE appointed several new officers in 2014: Julie Bowen as vice president, general counsel, and corporate secretary; Robert Jensen as vice president and director of the Centers for Medicare & Medicaid Services Alliance to Modernize Healthcare; and John A. Wilson as vice president of programs and technology of the National Security Engineering Center.

· MITRE published *Ten Strategies of a World-Class Cybersecurity Operations Center*, which offers practical ways to strengthen computer network defense. Written by Carson Zimmerman, a principal cybersecurity engineer, the free, online book is based on MITRE’s accumulated experience supporting large-scale U.S. military and civilian cybersecurity operations centers.

· IDG’s *CIO Magazine* named MITRE as a recipient of the CIO 100 award, which recognizes organizations around the world that exemplify the highest level of operational and strategic excellence in information technology.

· *The Boston Globe* named MITRE to its Top Places to Work list, which marked our sixth year on the list. MITRE ranked 15th in the category of largest companies, those with 1,000 or more employees.

· For the second consecutive year, *Hispanic Network Magazine* included MITRE on its list of Top STEM (science, technology, engineering, and mathematics) employers for Hispanics. The magazine polled hundreds of Fortune 1000 companies for its 2014 Best of the Best evaluations.
MITRE’s revenue from operations decreased 1.3% from $1,383 million in fiscal year 2013 to $1,365 million in fiscal year 2014. The year-over-year decrease in revenue was driven primarily by the government shutdown that impacted work program delivery to several of MITRE’s sponsors. Assets increased by $65 million, driven primarily by improved working capital. Staff population increased year-over-year, which reflects anticipated demand and shifts in the work program.
Executive Team

Mr. Alfred Grasso
President and
Chief Executive Officer

Mr. James Cook
Vice President and Director,
Center for Enterprise Modernization

Mr. Raymond Haller
Senior Vice President and National
Security Adviser to the CEO

Ms. Julie Bowen
Vice President, General Counsel,
and Corporate Secretary

Dr. Gregory Crawford
Vice President, Joint and Services
Portfolio, National Security Engineering
Center

Dr. Stephen Huffman
Senior Vice President and General
Manager, Center for National Security,
and Director, National Security
Engineering Center

Mr. Richard Byrne
Senior Vice President, Programs and
Technology, Center for Connected
Government

Mr. Gary Gagnon
Senior Vice President and Chief
Security Officer, National Security
Engineering Center

Mr. Joel Jacobs
Vice President and
Chief Information Officer
Board of Trustees

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Chairman
Distinguished Professor of Law and Public Policy, George Mason University, School of Law
Previous positions:
U.S. Senator
Governor of Virginia

Mr. David G. Fubini
Senior Lecturer, Harvard Business School
Director Emeritus, McKinsey & Company

Dr. Donald M. Kerr
Vice Chairman
Previous positions:
Principal Deputy Director of National Intelligence
Director, National Reconnaissance Office
Deputy Director for Science and Technology, Central Intelligence Agency

Ms. Jane F. Garvey
North America Chairman, Meridiam Infrastructure
Previous positions:
Executive Director, JP Morgan Securities, Infrastructure Advisory Group
Administrator, Federal Aviation Administration
Acting Administrator, Federal Highway Administration

Dr. George Campbell, Jr.
Previous positions:
President, The Cooper Union for the Advancement of Science and Art
President and CEO, National Action Council for Minorities in Engineering, Inc.
U.S. Delegate, International Telecommunications Union

Adm. Edmund P. Giambastiani, Jr., U.S. Navy (Ret.)
Previous positions:
Seventh Vice Chairman of the Joint Chiefs of Staff
NATO Supreme Allied Commander Transformation
Commander, U.S. Joint Forces Command

Mr. Nicholas M. Donofrio
Previous position:
IBM Executive Vice President, Innovation and Technology

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President and Chief Executive Officer, The MITRE Corporation

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Previous position:
Chairman and Chief Executive Officer, Kaiser Permanente
Dr. John J. Hamre
President and Chief Executive Officer, Center for Strategic and International Studies
Previous position: Deputy Secretary of Defense

Mr. John P. Stenbit
Previous positions: Assistant Secretary of Defense for Command, Control, Communications, and Intelligence
Executive Vice President, TRW

Gen. C. Robert Kehler, U.S. Air Force (Ret.)
Previous positions: Commander, U.S. Strategic Command
Commander, Air Force Space Command

Mr. Robert R. Everett
Honorary Member
Previous position: President, The MITRE Corporation

Mr. Cleve L. Killingsworth
Previous positions: Chairman and Chief Executive Officer, Blue Cross Blue Shield of Massachusetts
President and Chief Executive Officer, Health Alliance Plan

Honorary Member
Previous positions: Executive Director, Air Force Aid Society
Commander, Air Force Systems Command

Gen. Montgomery C. Meigs, U.S. Army (Ret.)
Visiting Professor in the Lyndon B. Johnson School of Public Affairs, University of Texas
Previous positions: President and Chief Executive Officer, Business Executives for National Security
Visiting Professor of Strategy and Military Operations, Georgetown University
Director, Joint IED Defeat Organization, Office of the Secretary of Defense

Dr. Jack P. Ruina
Honorary Member
(Deceased 2015)
Professor Emeritus of Electrical Engineering, Massachusetts Institute of Technology

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