Overview

Information Directorate, May 2019
MISSION:
To explore, prototype, and demonstrate high-impact, game changing technologies that enable the Air Force and Nation to maintain its superior technical advantage.

VISION:
To lead the Air Force and Nation in command, control, communications, computers, and intelligence (C4I) and cyber science, technology, research and development.

ROME = C⁴ + I
AFRL Mission & Vision

MISSION: Leading the discovery, development, and integration of affordable warfighting technologies for our air, space, and cyberspace forces.

VISION: We defend America by unleashing the power of innovative air and space technology.
Information Technologies Touch Every AFRL Directorate

C4+1I
Command, Control, Communications, Computers, Intelligence and Cyber
Strategic Drivers | Aligning with the National Defense Strategy

- Build A More Lethal Force | Modernize Key Capabilities
  - Nuclear Forces
  - Space And Cyberspace Warfighting Domains
  - Joint Lethality In Contested Environments
  - Command, Control, Communications, Computers And Intelligence, Surveillance And Reconnaissance (C4ISR)
  - Missile Defense
  - Forward Force Maneuver And Posture Resilience
  - Advanced Autonomous Systems
  - Resilient And Agile Logistics

- Strengthen Alliances And Attract New Partners

- Reform The Organization For Greater Performance And Affordability
  - Innovate At Speed
  - Rapid, Iterative Approaches, Development → Fielding
Funding Profile | FY18 Funds as of 30 Sep 18

Direct Warfighter Support 74%

Other S&T 26%

Supporting Operations □ All remaining □ □ □ □
Examples of Our Current and Future Innovations

**NOW**
- ATAK
- AERONET
- Gigashield

**NEAR**
- NINJA
- OA-DCGS
- Agile at the Edge

**MID**
- StreamlinedML
- Agile at the Edge

**FAR**
- Quantum IS
- MDC2

**READY**
- Responsive
- Relevant
- Revolutionary

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Historical Perspective

**Line of Communication** is a route that connects an operating military unit with its supply base, other units or headquarters. Controlling these has always been key to military strategy. A secure open line of communication is vital for any military force to continue to operate efficiently.
Early Years of Research

- Minicard Intelligence Data Handling System
- First Communication Satellite Echo 1
- ARPA Network RADC
- Cognitive Assistant That Learns and Organizes (CALO)
- Micro-Electro-Mechanical Systems (MEMS)
- John F. Dove Laser Technology Creator

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Rome, NY: A Rich Technology Heritage

**1817 - Erie Canal:** Started in Rome, NY and became the most famous and successful of America’s early towpath canals, connecting the Northeast to mid-America.

**1845 – Springfield, Albany, Buffalo Telegraph Line:** First commercial telegraph company – now known as the Associated Press.

**1954 – NYS Thruway:** First section opens just outside Rome, NY.

**1960 – Echo I:** First intercontinental satellite communications.
QUANTUM INFORMATION SCIENCE: THE NEXT TECHNOLOGICAL FRONTIER
Quantum Information Science

- Aspects of QIS are beginning to mature beyond purely theoretical
  - Many engineering challenges remain
  - We expect new concepts will emerge
- There are implications for USAF operational capabilities
  - Initial focus: timing and sensing applications
- AFRL S&T is informing and leveraging broader DoD, government, academic, industry and international efforts

| Quantum TIMING | Fewer timing updates required, Coherent EW, ISR, Improved Navigation |
| Quantum SENSING | Enhanced Inertial Navigation, Advanced low-SWaP sensors |
| Quantum COMM / NETWORKING | Space object threat assessment, Fieldable low-SWaP systems, Fully-quantum transmission |
| Quantum COMPUTING | Much faster data processing, Asset Optimization, Image/object Recognition |
Quantum Network

RI Goal: Demonstrate Quantum Network

- Trapped ION memory nodes provide unconditional security and flexibility over long distances
- Trapped ION nodes store and process quantum information
- Secure against eavesdropping

Game Changing Technologies
1st in AFRL/RI!
1st in NY State!
1st in DoD!
Quantum Information Science (QIS): Using the quantum mechanical properties of light and atomic systems for developing new capabilities in

(i) Timing, (ii) Sensing, (iii) Communication, (iv) Special-Purpose Computing, and (v) Computing

Approximate Quantum Technology Timelines

- Stand-Alone Clocks & Sensors
- Special-Purpose Computing
- Entangled Networks and Sensors
- Quantum Computers

Leverage: Secure satellite communications, Special-purpose computing, C2 asset optimization, Autonomy, Robust GPS, Timekeeping, Watch, Lead, Buried target detection, Leverage

5 Areas of Quantum Information Science (QIS)
Extreme Computing

Extreme Computing [Public/Private] Center of Excellence

- Current Von Neumann computing architectures are inefficient and do not scale
- Continue to near the end of ‘Moore’s Law’
- Foundational advances in computing architectures are needed
  - Quantum
  - Neuromorphic
  - Nano-electronic
  - Machine Learning
  - Artificial Intelligence

Neuromorphic Computing

Brain-Inspired, Extremely Low SWaP, Intelligent Computing At-The-Edge in Dynamic and Contested Mission Environments

- Benefits to Performance
  - Higher recognition accuracy
  - Better situational awareness
  - More robust decision making
- Benefits to SWaP
  - 1000X lower power enables:
    - Processing at-the-edge
    - Autonomous systems
- Benefits to Capabilities
  - Big data analytics
  - Multi-domain data-to-decision
  - Adaptive learning

RI Quantum Vision

- Nodes consist of arrays of trapped ions
- Entanglement mapping for long distance transmission over conventional channel
- Photon-based qubits provide interconnect and processing “on the fly”

Quantum Networking

Quantum Processing

Multi-Domain Deep Learning

Optical

RF

Hyperspectral

Intelligent Embedded HPC

ION

TRAPPED

1st in DoD
1st in NY State
1st in AFRL/RI

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CORE TECHNICAL COMPETENCIES (CTC)
Information Directorate Core Technical Competencies (CTC)

Putting The Right Information Into The Right Hands At The Right Time

Leveraging And Shaping The Cyber Domain To The Nation’s Advantage

Communications

Command & Control

Intellectual

Cyber

Computers

Exploiting Computing and Algorithms to Transform Big Data Into Information
Connectivity and Dissemination (CAD) CTC

Vision
Seamless, resilient networked communications fabric across the command and control intelligence surveillance and reconnaissance (C2ISR) enterprise – Assuring delivery of timely, reliable, and actionable information to warfighters and systems.

Mission
Provide agile and secure mission-responsive communications and information sharing globally.

Goals
• Agile and secure communications and networks
• Agnostic connectivity
• Autonomous link discover, creation and utilization
• Dissemination of Information at need, securely
Connectivity and Dissemination (CAD) CTC Highlights

**Android Tactical Assault Kit**
- ATAK is an Android based application with advanced collaborative geo-spatial sharing, and communication capabilities
- AFRL First "One Click" Nonexclusive License Application in Federal Government
- Over 100 licenses issued to date

**SecureView**
- Secure access to multiple independent levels of security classification on one consolidated workstation
- Provides customers with security and protection against data exfiltration
- Intuitive user interface that requires minimal training

**Aerial Layer Networking**
- Provide multi-faceted AF networks by developing agile, adaptable, programmable, resilient and secure capabilities for the Aerial Layer Network
- Flexible, ad-hoc autonomous networking, multiple levels of security on single aerial network
- Tactical Data Link Network SA & Management

**Next Gen Software Defined RF**
- Provide affordable, dynamic, software-defined Radio Frequency (SDRF) capabilities for on-demand communications, dynamically adjusted for threat conditions
- Affordable secure multi-mission waveforms for A2/AD environment
- 5X reduction in platform integration cost by enabling flexible adaptation to existing apertures

Putting The Right Information Into The Right Hands At The Right Time

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Cyber Science and Technology (CYB) CTC

Vision
Enable Air Force to conduct integrated multi-domain operations over an agile, trusted and resilient cyber infrastructure, through which we can project cyber power at a time and place of our choosing, with the same confidence and predictability already afforded to air and space operations.

Mission
Lead development of cyberspace science and technology necessary to address capability gaps and associated technical hard problems to establish cyberspace superiority and support the conduct of full-spectrum cyberspace operations integrated with other domains.

Goals:
• Enable hardware and software root of trust
• Cyber resiliency to fight through and recover from attack; ensuring cyberspace superiority
• Locate, acquire and process complex signals of interest
• Integrate full spectrum cyber capabilities into multi-domain operations

Leveraging And Shaping The Cyber Domain To The Nation’s Advantage

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Leveraging And Shaping The Cyber Domain To The Nation’s Advantage

**MUAS**
- Enhancing emerging baseline capabilities countering small COTS Unmanned Aircraft Systems (sUAS) by demonstrating prototypes in a relevant environment
- Openness and modularity allow for collaborative R&D ensuring rapid capability transition

**Asymmetric Cyber Warfare (ACW)**
- Identify, map and understand the newest forms of digital data in order to maximize the intelligence value and produce actionable information
- Develop software applications and methods to automatically map networked sensors and provide visualization of the network activity

**Lightweight Blockchain**
- Develop communication approaches that will survive highly contested/fragmented networks
- Enables creation of distributed “un-censorable” websites and command and control systems
- Demonstrated on cheap commodity hardware (Raspberry Pi $30)

**Communication Network Access Program**
- Multi-function transmit/receive capability to integrate EW / Cyber / Comm missions into a common radio platform
- Software-defined, reprogrammable radio frequency technology across wide frequency ranges
- High-precision, compact timing sources for high-resolution geolocation and triangulation of targets
Processing and Exploitation (PEX) CTC

Vision
Innovator of technologies which process and exploit data in near real time, analyze massive collections over time and employ continuous learning to deliver asymmetric decision speed to the Air Force.

Mission
Lead the discovery, development and transition of all-source multi-domain processing and exploitation innovations for the Air Force.

Goals
- Manage, process and exploit massive amounts of intelligence, surveillance, and reconnaissance (ISR) data
- Exploit targets in denied areas
- Process actionable ISR information via high performance systems
- Energy efficient computing
Processing and Exploitation (PEX) CTC Highlights

**Agile Condor / Blue Raven**
- Brain-Inspired, Intelligent Computing For Deploying Artificial Intelligence and Machine Learning Capabilities
- Low SWaP High Performance Ruggedized Embedded Computing
- Disruptive performance, scalable architecture, big data analytics

**Quantum Information Science**
- Provide ultra-secure quantum communication by establishing memory-based quantum network nodes, adapting the photon-based interconnects using integrated circuits
- Ability to perform quantum information processing between and within network nodes – can be extended to realize distributed quantum computing

**Actionable Intelligence Discovery and Exploitation (AIDE)**
- Uses the power of machine learning to provide the right intelligence to the right personnel at the right time
- Capture the Knowledge of our Analysts
- Shift the Burden from Airman to AI

**Advanced Text Exploitation Assistant (ATEA)**
- Automates the handling and exploitation of intelligence message traffic to help identify actors, activities, and actor networks, aggregating information across large volumes of textual data
- Automated extraction models for entities, events, and relations

Exploiting Computing And Algorithms To Transform Big Data Into Information

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Autonomy, Command & Control and Decision Support (AC2) CTC

Vision
Mastering and imposing complexity to command & control future multi-domain operations in an evolving battlespace with speed and scale.

Mission
Deliver revolutionary, trusted, affordable information technologies for agile, resilient and distributed Air Force command & control and autonomous systems.

Goals
- Master complexity through development of adaptive command & control systems-of-systems and services
- Control, impose and synchronize complex multi-domain effects chains
- Harness machine intelligence to increase command & control speed and scale of operations
- Realize large-scale multi-agent systems for autonomous planning, tasking and execution

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Multi-Domain Command and Control (MDC2)
- Create multiple, complex dilemmas for an adversary composed of non-kinetic & kinetic effects at overwhelming speed & scale
- Master C2 complexity through dynamic orchestration & distribution of situational awareness, decision-making, & force direction
- Harness machine intelligence to exponentially increase human capacity for command & control

StreamlinedML
- Develop a comprehensive machine learning framework tailored for Air Force and Department of Defense data and applications
- Increasing access to advanced learning capabilities supporting analysis of diverse data types, reasoning about the environment, and advanced decision support

Joint Effects Operations
- Develop and demonstrate capabilities that enable improved and faster decision making for multi-domain command and control
- Rapid multi-domain mission understanding, planning & assessment

Adaptive Cyber Command & Control (ACC2)
- Provide precise and predictable cyber effects estimates to ensure operational planners present viable cyber assets to combatant commanders considering multi-domain options
- Shorten time to integrate cyber operations into multi-domain operations plans
Machine Learning: Key Drivers

- Situational Awareness & Understanding
- Cyber/Space Operations
- Contested Operations
- Multi-Domain Command & Control

Leverage & Adapt → Formulate & Lead

AI/ML Execution Strategy: From foundational discovery to capability delivery

**DISCOVERY**
Solving Unique Hard AI, Autonomy, & ML Problems for AF/DoD

**ENGAGE**
AF/DoD, Academic, & Commercial Research Communities

**DEVELOP**
Develop: AF/DoD pipeline for fast-tracking AI/ML capabilities to AF applications and data

**DELIVER**
State-of-the-art capabilities to the warfighter

- QUANTUM IS
- AGILE CONDOR POD
- Embedded Conventional & Neuromorphic Computing
- Google Berkeley
- Massachusetts Institute of Technology
- Stanford University
- Carnegie Mellon University
- DARPA
- MDC2
- flyleaf
- ATAK
- OA DCGS

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**NINJA Counter-Small UAS System**

**CHALLENGE:** COTS Small Unmanned Aerial Systems (sUAS) have become ubiquitous due to their low cost and ease of use. They now present a very real threat.

Ninja provides link specific cyber detection and defeat of sUAS
- Precise, affordable, and agile solution to combat the threat
- Implemented an open system architecture leveraging crowd sourced algorithms
- Integrated with AFRLs Android Tactical Assault Kit for added functionality
- Proven in numerous operational domains for a multitude of customers
- Fielding to all AF installations to begin in FY19
- Works in concert with layered defense construct and is desired first engagement option
- Government wide interest from FAA, DOJ, DHS, DOI, and international partners

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Android Team Awareness Kit

The United States Air Force Research Laboratory (AFRL) Information Directorate seeks industry partners to license and commercialize the Android Team Awareness Kit.

ATAK is an Android based application with advanced collaborative geo-spatial sharing, and communication capabilities.

“One Click” License

AFRL First “One Click” Nonexclusive License Application in Federal Government

http://techlinkcenter.org/summaries/atak

Over 100 Signed Licenses!

Game Changing Technologies
Open Architecture (OA) Distributed Common Ground System (DCGS)

An Enterprise Wide Weapon System Modernization Enables Speed of ISR Capability Delivery

**What:** Air Force’s Information Technology Weapon System, 27 Globally Distributed Sites

**Challenge:** Outdated Technology, IT Capabilities (S/W & H/W) Take >5 Years To Field

**Solution:** A Comprehensive Modernization of the Weapon System Technology and Organization to Field Capability Faster

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**Transformation:**

- Modern Technology
  - Transitions: IT Systems, Workstations, Full Motion Video Capability
- A Wholistic Cultural Transformation

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Information Directorate Facilities

Machine Intelligence for ISR Laboratory
Secure Embedded High Performance Computing
Quantum Information Science Facility
Corporate Research and Development Server Facility (CRDSF)
Quantum Communications Laboratory
Microwave and Optical Communication Range
Cyber Experimentation Environment (CEE)
Command and Control Technology Center (C2TC)
Nanotechnology & Computational Intelligence Laboratory
RF Technology Center
Audio Processing Lab
High Performance Computing Facility
Cyber Operations Technology Facility (COTF)
Operational Information Management Lab
Network-Centric Integration & Interoperability Facility (NCIIF)
Integrated Intelligence Innovation Facility (I3F)
Advanced Computing Applications Laboratory
K5 Laboratory
Command and Control Concept Center (C2CC)
Cyber Integration & Transition Environment
Advanced Computing Applications Laboratory
Corporate Collateral Facility (CCF)
Cyber Experimentation Environment (CEE)
IRISH HILL
TANNER HILL
7500ft (2286m)
Newport Remote Research Site
SATCOM Facility
Stockbridge Remote Research Site

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Information Directorate Facilities

65 Acre Campus, 30 Laboratories & Facilities, And 882,000 Sq Ft Floor Space
Newport Research Site

Far Field, Elevated Outdoor Antenna Test Range

- 78 Acres
- 360 Degree Pattern Measurement
- Established in 1972
- Ideal Geography
- Essential Measurements of the F-35 Aircraft Antenna Patterns
- Inflatable Reflector Antennas for SOCOM
- 15 Commercial Test Agreements - 1 Pending

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Stockbridge Research Site
RF and Small UAS Experimental Facility

- 300 Acre Flexible Test Site, Varying In Relative Distance, Topology And Foliage Density
- Heavy-duty Turntable With A 200’ High Arched Measurement Probe – Large Aircraft And Vehicle Capable
- 120’ Walkup Tower For LOS And Optical Links
- Controllable Contested Environment
- All Weather, Full Season, Configurable RF Capability
- C4ISR, Cyber, Spectrum, Networking
- Flexible Frequency Authorizations
- SUAS Airfield
- Fixed Wing And VTOL Platforms
- Trained Flight Personnel
- Experiment, Management And Control Facility
- Flexible Laboratory Space
- Operations And Control Room

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Information Directorate

**Rome**
- 65 Acre Campus
- 30 Laboratories & Facilities
- 882,000 sq ft floor space

**Stockbridge**
- Used for development of and real world experimentation with advanced radio frequency (RF)/optical communications, networking and information technologies, cyber techniques and effects, including small unmanned aircraft systems.

**Newport**
- Primary mission: To evaluate antenna performance on full scale aircraft and make recommendations for improvement.
Open Innovation Environment: Agility + Innovation + Partnerships

- Developing an agile and transformative ecosystem at AFRL/RI, connecting global technology leaders to collaborate and solve complex Air Force computing challenges.

- Linking researchers from government, industry, and academia, to share the best and brightest people, ideas, and facilities.

S-UAS Testing | Quantum Facilities | Neuromorphic Computing Facilities

Discovery Lab Outside the Fence for High Risk, High Impact Problem Solving

- Open Campus Facility Within Walking Distance Of AFRL Campus
- Hard And Soft Lab Space
- Collaboration Space
- Event Space
- One Facility For Outreach
- Co-located Partners, Offices, Labs, Event Center
- Basic Research Hub For C4I And Cyber

Single Location, Robust Environment
Embedded Team

**Embedded Here**
- 222nd C2 Squadron augmenting NROC (27 reservists)
- Joint Reserve Intelligence Center (JRIC) (44 reservists)
- Joint Military Analysis Center (JMAC) (23 full time)
- Organic 5 Air Force 14N Intel Officers (1Lt, 3Capt, 1Col)
- Organic 6 Air Force Enlisted Intel Specialists

**Embedded There**
- Air Combat Command
- Air Force Space Command
- SAF/AQR
- Colleges of Nanoscale Science and Engineering
- Air Force Academy
- SOCOM
- OSD
- AFLCMC
- 24th AF
- AFRL Space Vehicles Directorate
OPPORTUNITIES
Information Directorate Summer Internships

- Summer Internship Program
- Advanced Course in Engineering (ACE) Internship Program
- Information Institute Visiting Faculty Research Program (VFRP)

http://www.wpafb.af.mil/afrl/ri/
Advanced Course in Engineering (ACE)

Summer Internship Program

Mission: To develop the next generation of competent cyber leaders of consequence through technical excellence, on time performance, and effective communication.

ACE Capstone Exercise 2018

- Executed a high-stress, integrated cyber-physical exercise
- Multi-domain environment of cyber, air, land, and space assets
- Incorporated both real and simulated platforms at the Stockbridge facility

2018 ACE Class:
- 1 RI Officer
- 10 AFROTC Cadets
- 2 AFOTEC Officers
- 6 UK (3 civ, 3 mil)
- 14 Civilians

2014 – 2017 ACE Statistics:
- 105 ACE graduates (381 total over 15 year history)
- 8 ACE grads working at AFRL/RI
- 72 different universities
- 2 countries (UK & US)
- 17 research projects with results delivered to customers
Visiting Faculty Research Program

Autonomy, C2, and Decision Support
- Multi-Domain Mission Assurance
- Optimized Machine Learning in Large-Scale and Complex Systems
- Decentralized Planning for Command and Control
- Mission-Derived Enterprise and Tactical Information Sharing
- Reactive Service Migration
- Graph-Theoretical Approaches to Explore Mission Impact Analysis
- Response-based Adaptive Sampling Techniques

Connectivity and Dissemination
- Blockchain-based Information Dissemination across Network Domains
- Dynamic Resource Allocation in Adverse Networks
- Cognitive RF Spectrum Mobility
- Wireless Optical Communications
- Wireless Sensor Networks in Contaminated Environments
- Adversary Networking and Communication Links
- TKI Communications - Materials and Mechanisms
- Computational Trust in Cross Domain Information Sharing

Next-generation Aerial Directional Data Link & Networking (NDLN)
- Advanced High Speed Data Links
- Complex Network and Information Modeling & Inference
- Quantum Networking with Atom-based Quantum Repeaters
- Agile Networking for the Aerial Layer
- Software Defined Networking
- Ultra-broadband Networking: mmWaves, THz Band, and Beyond
- Vertically Aligned Computing (VAC)

Cyber Science and Technology
- Cyber Agility Research and Applications
- Network Defense through Dynamic Attack Surfaces
- Foundations of Resilient and Trusted Systems
- Mobile Communications
- Digital Signal Processing
- Synthetic Aperture Radar (SAR) Imaging
- Optical Interconnects

The 2019 Visiting Faculty Research Program
November 1, 2018 - September 30, 2019

http://www.wpafb.af.mil/Welcome/Fact-Sheets/Display/Article/836756

Possible to bring Graduate Students along as well!

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Information Directorate Information Institute (II)

Mission

• Strengthen and expand information technology research within the Information Directorate (RI)

• Develop collaborative relationships among and between academia and the Information Directorate

• Increase research emphasis in areas of information technologies critical to RI’s mission
Visiting Faculty Research Program (VFRP) information:

Information Institute (II) Summer Program

A virtual RI organization with academia performing research addressing AF hard problems

2018 II Visiting Researchers • 62 Professors • 16 Students
Information Institute Current Membership

Memberships with 78 Institutions in 30 States

Air Force Academy
Air Force Institute of Technology
AFRL Information Directorate
Arizona State University
Auburn University
Brescia University
California State University, Northridge
Central Florida University
Central State University
City College of New York
Clarkson University
Clayton State University
Colorado State University
Cornell University
Dillard University
Embry-Riddle Aeronautical University
Florida Atlantic University
Florida Institute of Technology
Florida International University
Georgia Institute of Technology
George Mason University
Howard University
Indiana University of Pennsylvania
Iowa State University
LaSalle University
Louisiana State University
Louisiana Tech University
Minnesota State University
Missouri University of Science & Technology
Montana State University
Navajo Technical University
New Jersey Institute of Technology
Norfolk State University
Northeastern University
Northern Arizona University
Northwestern University
Norwich University
Prairie View A&M University
Purdue University
Rensselaer Polytechnic Institute
Rochester Institute of Technology
Rose-Hulman Institute of Technology
Rutgers – Newark College of Arts & Sciences
San Diego State University
SUNY Binghamton
SUNY Polytechnic Institute
SUNY Stony Brook
Syracuse University
Tennessee State University
Texas A&M University
Texas Southern University
University of Buffalo
University of California Los Angeles
University of Central Florida
University of Cincinnati
University of Connecticut
University of Dayton
University of Kansas
University of Hawaii
University of Maryland
University of Massachusetts, Amherst
University of Massachusetts, Dartmouth
University of Massachusetts, Lowell
University of Minnesota - Twin Cities
University of Missouri, Kansas City
University of North Texas
University of Oklahoma
University of Rochester
University of South Alabama
University of South Carolina
University of South Florida, Tampa
University of Tulsa
Utah State University
Utica College
Vanderbilt University
Virginia Polytechnic Institute and State University
Wichita State University

As of MAY 2019

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Basic Research

II Visiting Faculty Research Program (VFRP)  AFOSR Summer Faculty Fellowship Program (SFFP)

The Information Directorate collaborates with universities on research in key areas that can help our nation secure its cyberspace. Some of our advertised research topics include:

- Cyber Agility Research and Applications
- Multi-Domain Mission Assurance
- Cognitive RF Spectrum Mutability
- Computational Trust in Cross-Domain Information Sharing
- Neuromorphic Computing
- Application of Game Theory and Mechanism Design to Cyber Security
- Optimized Machine Learning in Large-Scale Complex Systems
- Trusted Software-Intensive Systems Engineering
- Secure Processing Systems

Research topics can be viewed at the VFRP and SFFP web sites:

http://www.wpafb.af.mil/Welcome/Fact-Sheets/Display/Article/836756/
http://afsffp.sysplus.com/
## Information Institute (II)

<table>
<thead>
<tr>
<th>Impact to AFRL/RI</th>
<th>Impact to Academia</th>
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<tbody>
<tr>
<td>• <em>Early access</em> to innovation</td>
<td>• <em>Interesting</em> problems</td>
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<tr>
<td>• <em>Help us</em> stay abreast of new technology trends</td>
<td>• <em>Opportunities</em> for collaborative research</td>
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<tr>
<td>• <em>Enhance</em> the RI workforce</td>
<td>• <em>Employment opportunities</em> for students</td>
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<td>• <em>Help foster</em> a collegial environment for research</td>
<td>• <em>Sabbatical leave</em> appointments</td>
</tr>
<tr>
<td>• <em>Serve</em> as mentors for staff enrichment</td>
<td>• <em>Financial support</em> for research</td>
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<tr>
<td>• <em>Source</em> of seminar speakers</td>
<td>• <em>Aids</em> in the transition of technology to customers</td>
</tr>
<tr>
<td>• <em>Serve</em> as a clearing house and broker for collaborative research opportunities</td>
<td>• <em>Connection</em> to research opportunities with AFOSR</td>
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AFOSR Basic Research

Cyber Security Emphasis:

- **Security by Design - Modeling, Analysis, Verification:** [Deter, Protect, Detect, Adapt]
  - New authentication and authorization schemes; access control; information flow
  - Language-based techniques & security protocols
  - New principles for formal verification

- **Resilient Techniques Against Cyber Attacks:** [Deter, Protect, Detect]
  - Operating System-level defense with provable security
  - Provably secure obfuscation of program/circuit/memory; Fully Homomorphic Encryption
  - Secure and/or verifiable delegated computation

- **Security with Unconventional Technologies:** [Deter, Protect, Detect]
  - Nanomaterials properties as substitutes for standard security constructs
  - Secure future nano devices and 3D integrated circuits
  - Quantum cryptography and protocols
Rome NY Area Activities

- DUCK HUNTING
- UPPER MOHAWK VALLEY
- FISHING
- Salmon River Oneida Lake
- SWIMMING
- Lake Delta State Park
- WINTER ICE
- RACING
- Lake George
- SCENIC HIKING
- Adirondack Mountains, Watkins Glen State Park
- WHITEWATER CHALLENGE/KAYAKING
- Old Forge
- HARNESS RACES
- Saratoga Springs
- Vernon Downs
- SKIING
- Whiteface Mountain, McCauley Mountain, Gore Mountain
- DOG SLED RACES
- Lake George Winter Carnival
- ROAD RACE
- Utica Boilermaker
- WATERSKIING
- Hinkley Lake
- CROSS-COUNTRY SKIING
- Boonville
- and more...
Over 25% of the top U.S. Engineering Schools within 230 Mile Radius
AFRL Industry Opportunities

Topics published on https://www.fbo.gov, keyword “AFRL”

Broad Area Announcements (BAA), Requests for Information, etc

Topics tailored to solving critical AFRL technology needs

Using innovative open solicitation for agile requirements

BAA 2-step (white paper / proposal) process saves vendor time and money

Expedited obligation process (~90 days)
Commercialization Academy

- Satisfies SECDEF goals for “Lab to Market” and “Bending the Cost Curve”
- Enhances AFRL Entrepreneur Opportunity Program (EOP)
- Encourages new “start-up” companies
- Since Fall 2015 – 57 companies have been formed for commercial marketing, 26 companies (46%) are still active!
- 26 licenses completed with the Lab, 6 Licenses in Process
- Provides Entrepreneurial-based training opportunities to AFRL Workforce
- Pioneering alternative methods for tech transition
- Award winning approach
Technology Transfer

Griffiss Institute - Partnership Intermediary

A Nonprofit Corporation - The Information Directorate’s Force - Multiplier to Facilitate

- Technology transfer
- Face to industry and academia
- Business incubator & accelerator
- STEM
- Invention Disclosures
- Potential Licensees
- Commercialization Academy
- PhD Program; Clarkson and Syracuse University
- Outside The Fence Laboratory Support
- AFA Cyber Patriot
Griffiss Institute

- Partnership Intermediary with Information Directorate
  - Facilitate Technology Transfer
    - T2 Agreements
    - Intellectual Property
    - Commercialization
    - Technical Outreach
  - AFRL Innovation Institutes (WBI, Doolittle, NM, BRICC)
  - Network - other PIAs (TechLink, MiTech, NYSTEC, CTRAC, AFWERX, etc), Incubators, National and Regional FLC
- Local Educational Outreach STEM
- Information Institute Mission Execution – a virtual academic organization with 50+ academic institutions across the nation with interest in the RI technology
- Air Force STEM
- Internships

- NYS Certified Business Incubator
- Center for Training and Education
Industry Opportunities

Broad Agency Announcement

• Using Open-Open BAAs (unique to RI Directorate)
• Establishes innovative open solicitation for agile requirements
• Topics published on FedBizOpps
• Topics tailored to solving critical AFRL technology needs
• Uses 2-step (white paper / proposal) process that saves vendor time and money
• Expedites obligation process (~90 days)
• Centrally managed Contracting Officer
• Currently 44 Open BAAs within RI

https://www.fbo.gov
Community Participation

Combined Federal Campaign
Science Fair Judges
Feed our Vets
Food Bank
Project Fibonacci Program
Salvation Army Angel Tree
Rotary Club
Leadership Mohawk Valley
Student Shadow Program
STEM Volunteer
Red Cross Blood Drive
AFCEA STEM Scholarships
Rome Chamber
Take your Student to Work Day

Integrity First, Service Before Self, Excellence In All We Do!
Science, Technology, Engineering and Math (STEM)

**Lego MINDSTORMS Education Robot Sets**
License, Robotics
Engineering Curriculum
and STEM Tools
> $100K to area schools

**AFRL Challenge Competition**

**Central Association for the Blind and Visually Impaired (CABVI)**

**DimensionU - Competition**
Staley Upper Elementary School
Teaching Future Scientist and Engineers

2014 – 2018

Students Reached: 7,700+

RI Volunteer Hours: 3,800+

Students in STEM Summer Camps: 750+
Information Technology Governmental Collaboration

**USA**
- AFMC
- AFSOC
- AFSPC
- ANG
- 24th & 25th AF
- AMC
- ACC
- AFLCMC
- SAF
- SMC
- ...

**Academia**
- 90+ grants
- Information Institute – 80+ members
- 130+ EPAs
- Visiting Faculty Research Program
- Research Fellowships
- STEM
- Centers of Excellence
- ...

**Joint Community**
- STRATCOM
- TRANSCOM
- NORTHCOM
- CYBERCOM
- CENTCOM
- Army
- Navy
- Marines
- ...

**Industry**
- 200+ contractual partners
- IR&D
- 60+ CRADAs
- SBIR/STTR
- ...

**International**
- PAs
- TTCP
- NATO
- EOARD
- AOARD
- ...

**INTEL Community**
- DIA
- CIA
- IARPA
- NSA
- NRO
- NGA
- NASIC
- ...

**Other DoD**
- DARPA
- DTRA
- Cyber COI
- C4I COI
- ...

**Others**
- FBI
- FFRDCs
- NASA
- DHS
- DoE Labs
- ...

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As of 14 Jan 19
METRICS
World Class Talent
Future Starts Here | Government Career Classifications

- Electronics Engineering
- Computer Science
- Computer Engineering
- Physics
- Mathematics
- Operations Research
- General Engineering
- Mechanical Engineering
- Materials Engineering
- Civil Engineering
- Environmental Engineering
- Industrial Engineering
- Maintenance Mechanic & Fabrication
- Telecommunications
- Safety & Occupational Health Management
- Human Resources Management
- Logistics Management
- Architecture
- Business Administration
- Financial Management
- Patent Attorney & Legal Services
- Cartography
- Contracting
- Police

Total Government Staffing – 816
Total Directorate Staffing – 1,219

Students (Including II) (112)
Visiting Professors (62)

Military Professional Staff (14)
Contractor Professional Staff (70)
Civilian Scientist & Engineers (384)
Contractor Scientist & Engineers (333)
Civilian Professional Staff (371)
Military Scientist & Engineers (47)

Source: <webeis>
AFRL/RIB
as of 30Sep19

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Technology Transfer

*Created* to ensure Air Force S&E activities are transferred or shared with state and local governments, academia and industry.

The exchange of knowledge, expertise, equipment, and testing facilities leverages DoD research and development investment.

<table>
<thead>
<tr>
<th>AF Org</th>
<th>CRADA</th>
<th>EPA</th>
<th>CTA</th>
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<td>32</td>
<td>7</td>
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<tr>
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<tr>
<td>RY</td>
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As of FEB 2019 Source: DTTIS
Intellectual Capital

“The patent system … added the fuel of interest to the fire of genius, in the discovery and production of new and useful things.” - Abraham Lincoln

Patents Issued

<table>
<thead>
<tr>
<th>FY</th>
<th>FY13</th>
<th>FY14</th>
<th>FY15</th>
<th>FY16</th>
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<td>9</td>
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Federally Registered Trademarks

Quantifiable Progress: Patent Applications Filed

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</table>

Invention Disclosures

<table>
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<th>FY16</th>
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<td>8</td>
</tr>
</tbody>
</table>

65-70% Of Patent Applications Result In Awarded Patents!
90% Of Invention Disclosures Result In Patent Applications Submitted To The USPTO

Figures updated as of Aug 2019

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Business Agility

Integrated Team Operates at *Speed of Need*

- **Agile Cyber Technology (ACT II)**
  - Increased from $300M to $950M IDIQ Contract
  - Effort set aside for Small Business prime awards
- **Other Transaction Authority (OTA)**
  - Non FAR-based contracting vehicle for agile acquisition following Better Buying Power 3.0 goals

<table>
<thead>
<tr>
<th>AFRL Small Business Metrics</th>
<th>FY17 AFRL &amp; RI GOALS</th>
<th>FY17 RI ACTUALS</th>
<th>FY18 AFRL ACTUALS</th>
<th>FY18 AFRL &amp; RI GOALS</th>
<th>FY18 RI ACTUALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Business</td>
<td>39.36%</td>
<td>47.01%</td>
<td>47.81%</td>
<td>40.58%</td>
<td>39.09%</td>
</tr>
<tr>
<td>Small Disadvantaged Business</td>
<td>4.44%</td>
<td>4.59%</td>
<td>7.24%</td>
<td>4.98%</td>
<td>3.31%</td>
</tr>
<tr>
<td>Service-Disabled Veteran Business</td>
<td>1.03%</td>
<td>1.84%</td>
<td>1.85%</td>
<td>1.29%</td>
<td>1.70%</td>
</tr>
<tr>
<td>Women-Owned Business</td>
<td>6.20%</td>
<td>9.36%</td>
<td>8.18%</td>
<td>6.72%</td>
<td>8.39%</td>
</tr>
<tr>
<td>Hub Zone Business</td>
<td>0.75%</td>
<td>2.60%</td>
<td>1.13%</td>
<td>0.86%</td>
<td>1.19%</td>
</tr>
</tbody>
</table>

Source: FPDS-NG (Small Business Achievements by Awarding Organization Report), as of 30 SEP 2018

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Industry Opportunities

Small Business Innovative Research

- Rapidly brings innovations from small businesses applied to solve critical technology needs
- 10-25 SBIR/STTR topics generated annually (PEO and Internal)
- 10-15 topics awarded, 250+ proposals & evaluations (annually)
- 30-40 new Phase I and 20-30 new Phase II awards (annually)
- 143 active Phase I and Phase II SBIR/STTRs
- 10 active Phase III Awards = Transitions!
- 12 STTPs completed and funded (Enhancements and Follow on Phase II’s)
- 30% of firms awarded have fewer than 10 RI SBIR contracts

As of 20 March 2019
# Broad Agency Announcement (BAA) Process

The Information Directorate utilizes a unique and innovative open solicitation process that allows for agile acquisition of research and development – potential for contracts, grants, and cooperative agreements, and other transactions.

Topics are published to [www.fbo.gov](http://www.fbo.gov) Use keyword “AFRL”. See follow-on BAA slides for more info

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## Agile Cyber Technology 2 (ACT 2)

**$950M Multiple Award IDIQ Contract**

Agility to provide cyber solutions (e.g., 24AF)

Potential Subcontracting Opportunities through:
- Radiance Technologies, Inc.
  - brad.atkins@radianttech.com
- Invictus International Consulting, LLC
  - april.jackson@invictusic.com
- Global InfoTek, Inc.
  - karen.emami@globalinfotek.com
- CNF Technologies Corporation
  - pete.anderson@cnftech.com
- Assured Information Security, Inc.
  - Nicole Capodiferro: capodiferron@ainfosec.com

---

## Other Transaction for Prototype Authority (OTA)

### Modernized vehicle for non-traditional vendors

Non FAR-based contracting vehicle for agile acquisition

Tech POC: Mark Southcott
mark.southcott.1@us.af.mil

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## Small Business

### Near-term Opportunity

- Small Business Innovation Research BAA 18.3/C DoD pre-release will be available 8/24/18 to 9/23/18
- The BAA will be open for proposals 9/24/18 to 10/23/18
- More information can be found on [www.sbir.gov](http://www.sbir.gov)

RI SBIR Manager: Michael.Graniero@us.af.mil

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## NETCENTS-2

**Multiple Award IDIQ Contract**

The Network-Centric Solutions-2 Indefinite-Delivery, Indefinite-Quantity (IDIQ) contracts provide RI with a source of netcentric and IT products, services, and solutions. Use of the NETCENTS-2 contracts is a primary contract vehicle for Air Force organizations.


## One Acquisition Solution for Integrated Services (OASIS)

**Multiple Award IDIQ Contract**

The OASIS and OASIS Small Business contracts provide RI with flexible solutions for complex professional services (non-R&D).

[https://www.gsa.gov/acquisition/products-services/professional-services/one-acquisition-solution-for-integrated-services-oasis](https://www.gsa.gov/acquisition/products-services/professional-services/one-acquisition-solution-for-integrated-services-oasis)

## Alliant Government-Wide Acquisition Contract (GWAC)

**Multiple Award IDIQ Contract**

This GSA enterprise GWAC provides RI with flexible access to customized IT solutions from a large, diverse pool of industry partners.


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## RI Collaborative Research & Development Agreements (CRADAs), Educational Partnership Agreements, Commercial Test Agreements, and Internships

The Information Directorate regularly uses these types of business arrangements to facilitate the exchange of knowledge, expertise, equipment, and testing facilities in order to leverage DoD research and development investments.

**Office of Research and Technology Applications:**
- brian.abbe@us.af.mil, Phone: 315-330-4962

**Internship Information – Visit:**

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C^4+I Results for AF and the Nation

Defending America by Unleashing the Power of Innovation
Questions
Defending America by Unleashing the Power of Innovation

Questions?
BACKUPS