



AFRL

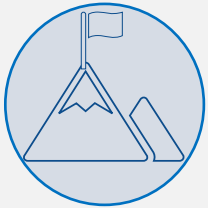
AIR FORCE RESEARCH LABORATORY OVERVIEW

INFORMATION DIRECTORATE



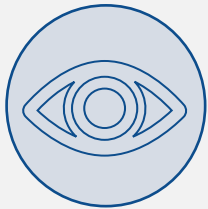
Air Force Research Laboratory

Mission & Vision



AFRL MISSION:

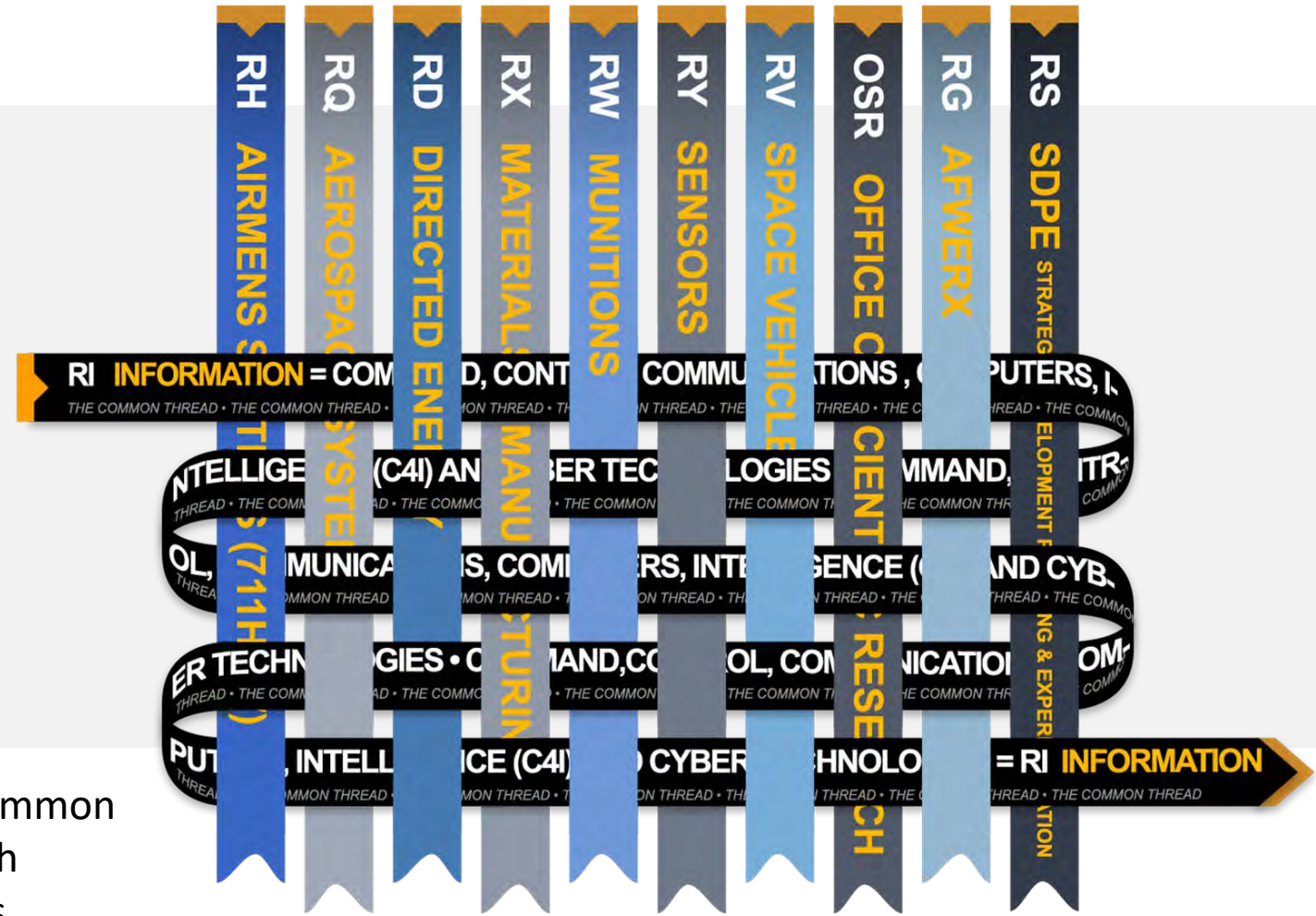
We lead, discover, develop and deliver science, technology and innovation for Warfighters.



AFRL VISION:

To arm Warfighters that dominate in time, space and complexity across all operating domains.

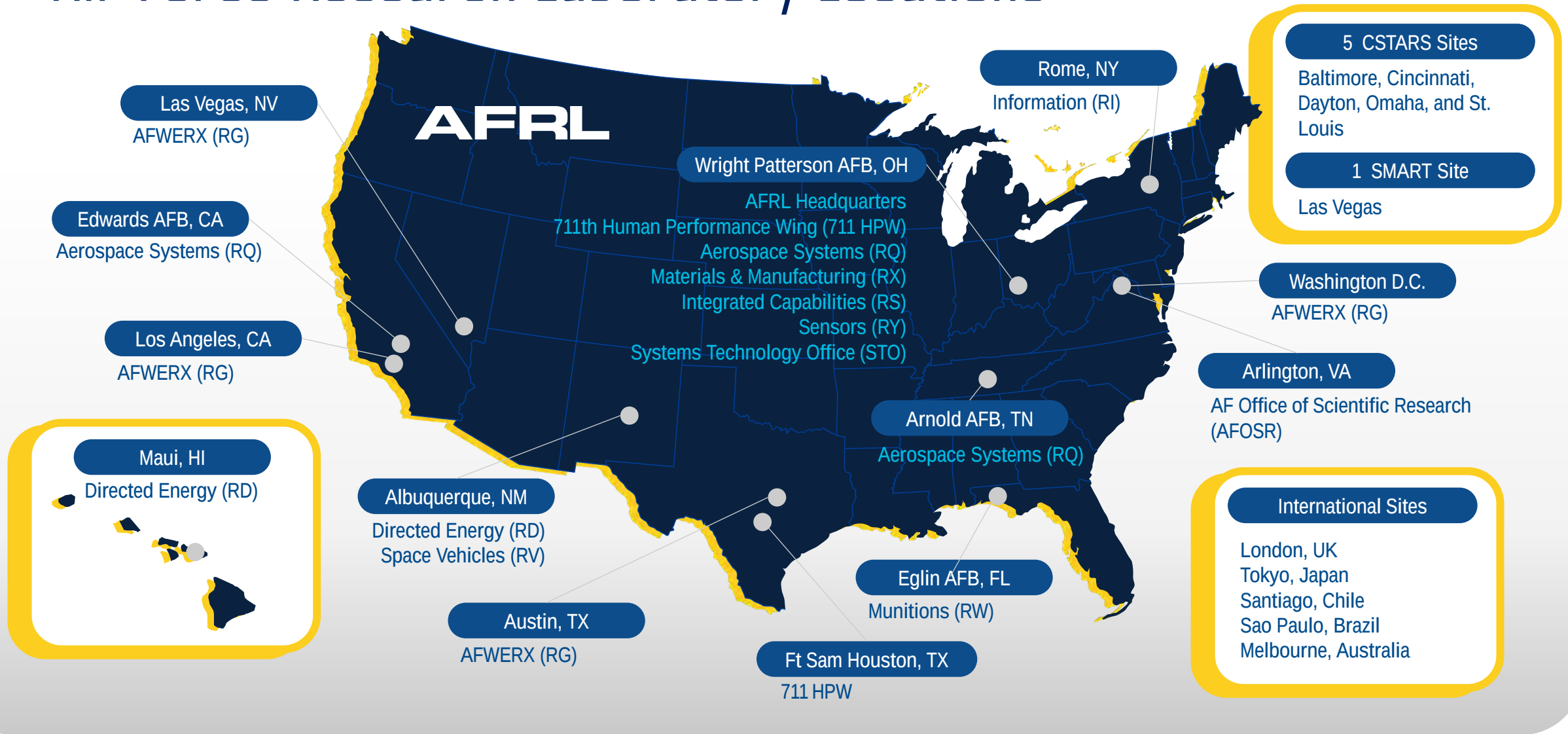
The Information Directorate is the common thread between all Air Force Research Laboratory directorates and locations





Air Force Research Laboratory Locations

*C-STARS: Center for the Sustainment of Trauma and Readiness Skills
*SMART: Sustained Medical and Readiness Trained





Air Force Research Laboratory

Information Directorate Mission & Vision



MISSION:

To explore, prototype, and demonstrate high-impact, game changing technologies that enable the Department of Air Force and Nation to maintain its superior technical advantage.



VISION:

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



The Information Directorate focus is



Information Directorate Leadership

Chief Engineer



Associate Director/Tech. Advisor



Chief Scientist



Deputy Director



Director/Commander



Deputy CC (Section CC)



First Sergeant



Technical Divisions

Intelligence Systems



Computing & Communications



Information Systems



Information Exploitation & Operations



Special Programs



Core Technical Competency Leads

Processing & Exploitation



Connectivity & Dissemination



Autonomy, C2 & Decision Support



Cyber Science & Technology



Senior Planner



Senior Scientists

Processing & Exploitation



Information Assurance



Command & Control



Mission Support

Comptroller



Strategic Planning & Integration



Contracting



Integration & Operations



Judge Advocate



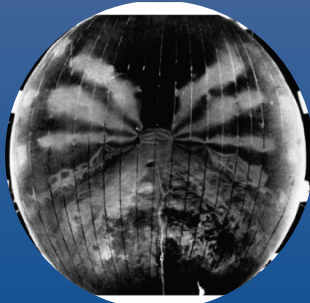
Historic Moments from the Labs



**Minicard
Intelligence
Data Handling
System**



**ARPA Network
RADC**



**First
Communication
Satellite Echo 1**



**Cognitive
Assistant That
Learns and
Organizes
(CALO)**



**John F. Dove
Laser Disc
Technology
Creator**



**Micro-Electro-
Mechanical
Systems
(MEMS)**



A rich heritage of research innovation



Surveillance Radar



PAVE Mover



Airborne Digital Map System



IR Camera for B-52



Moving Target Indicators Experiment



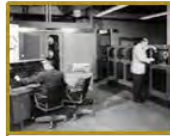
Single Pass AirDrop



Selective Cyber Operations Technology Integration



ECHO-I SATCOM (1st SAT Comm)



Russian to English machine translation



3D Memory



Advanced Planning System



Multi-Level Security



Cyber Situational Awareness



NSDC



Rome Air Development Center
Established 1951 – 1991



Rome Laboratory
Established 1991 – 1997



AF Research Lab Information Directorate
Established 1997 – Present



Intelligence Data Handling Systems



Skylab Tracking



SEM-E Modules For the F-22



Software Programmable Radio (forerunner of JTRS)



CONDOR Supercomputer



DCGS



DARPA's agent for ARPANET



Research Facility Newport & Stockbridge



Track & ID Fusion Algorithms for AWACS



Off-Board Data On J-STARS



WebTAS



Talent at the Information Directorate

AN EFFECTIVE, EFFICIENT, & DIVERSE CROSS-FUNCTIONAL TEAM: S&E - Program Management - Operations - Finance - Legal - Contracting

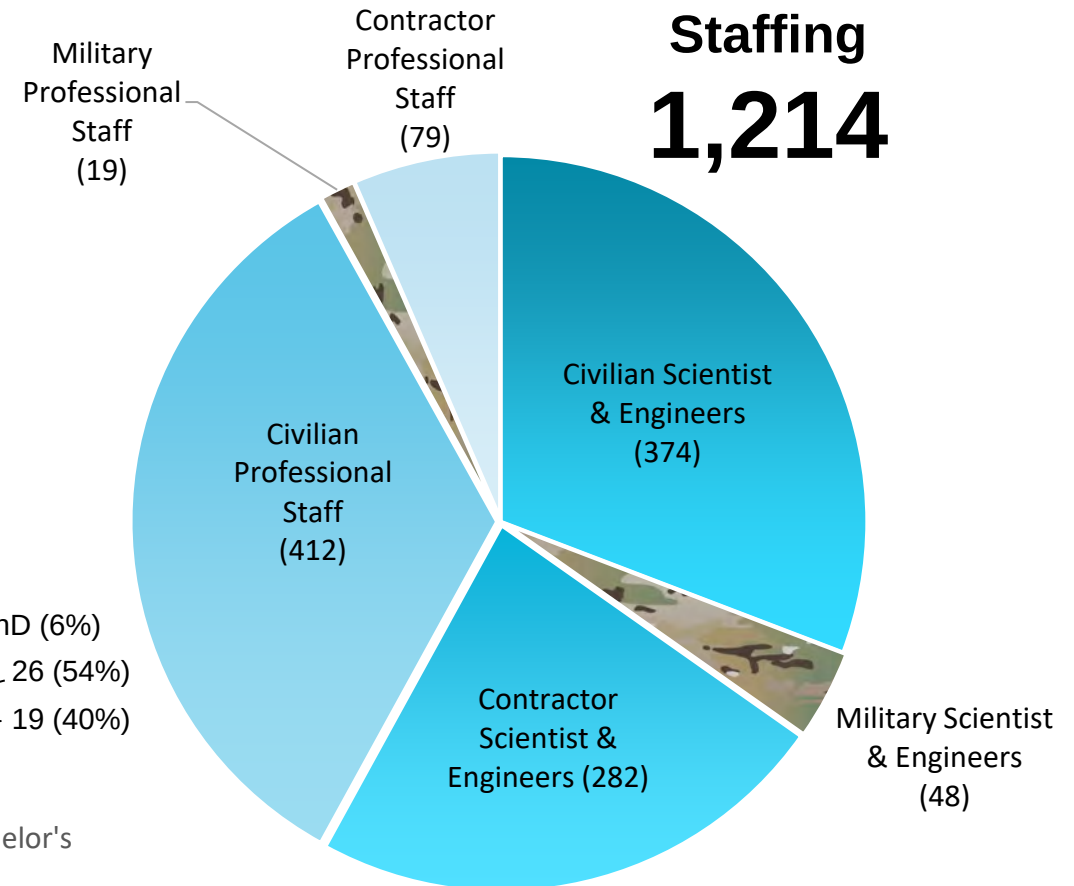
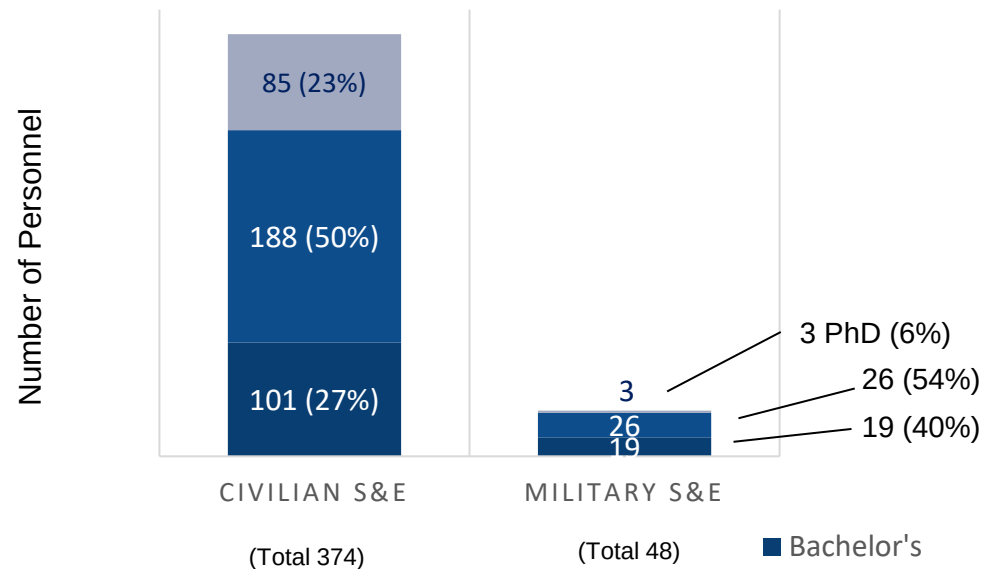
GOVERNMENT CAREER CLASSIFICATIONS

- Electronics Engineering
- Computer Science
- Engineering (General, Computer, Mechanical, Materials, Civil, Environmental, Industrial)
- Physics
- Mathematics
- Operations Research
- Telecommunications
- Human Resources Management
- Logistics Management
- Public Affairs
- Architecture
- Business Administration
- Financial Management
- Contracting
- Patent Attorney & Legal Services
- Police

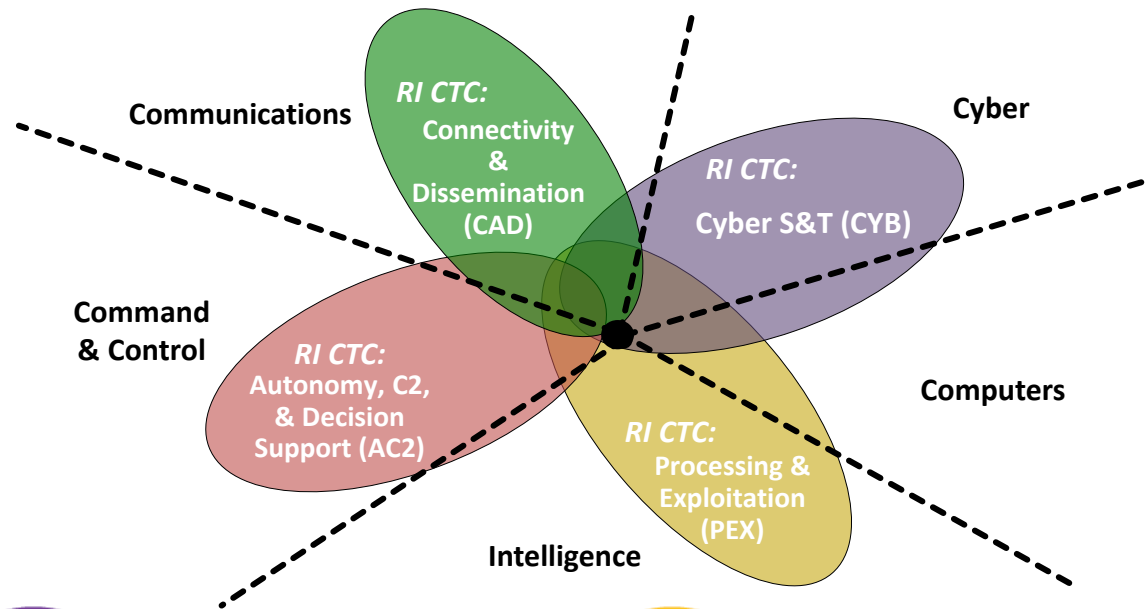
Total Govt Staffing
853

Total Directorate Staffing
1,214

GOVERNMENT S&E ACADEMIC DEGREES
FY 2023 (TOTAL 419)



Core Technical Competencies at RI



PUTTING THE RIGHT INFORMATION INTO THE RIGHT HANDS AT THE RIGHT TIME

Vision: Seamless, resilient networked communications fabric across the command, and control intelligence, surveillance and reconnaissance (C2ISR) enterprise



LEVERAGING AND SHAPING THE CYBER DOMAIN TO THE NATION'S ADVANTAGE

Vision: An Air Force equipped with technologies that enable our freedom to operate in cyberspace while denying the adversary the same.



EXPLOITING COMPUTING & ALGORITHMS TO TRANSFORM BIG DATA INTO INFORMATION

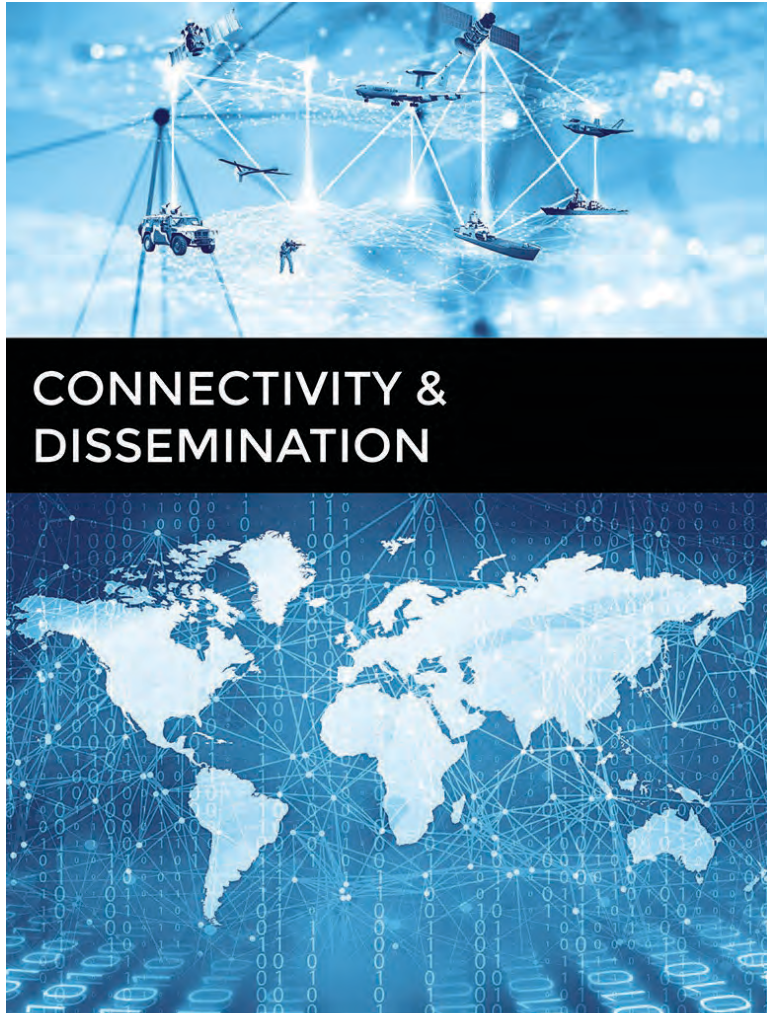
Vision: Innovator of technologies that process and exploit data in near real time, analyze massive collections over time and employ continuous learning to deliver asymmetric decision speed to the Air Force and Intelligence Community.



MASTERING COMPLEXITY OF MULTI-DOMAIN COMMAND & CONTROL

Vision: Mastering and imposing complexity to C2 joint all-domain operations in an evolving battlespace at speed and scale

Connectivity and Dissemination (CAD)



CONNECTIVITY & DISSEMINATION

Vision

Seamless, multi-domain, *network of networks* connectivity fabric across the command and control intelligence, surveillance and reconnaissance (C2ISR) enterprise, assuring delivery of timely, secure, 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
- Platform agnostic connectivity
- Autonomous link discovery, creation and utilization
- Dissemination of information at need, securely

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



Cyber Science and Technology (CYB)



CYBER SCIENCE AND TECHNOLOGY



Vision

An Air Force equipped with technologies that enable our freedom to operate in cyberspace while denying the adversary the same.

Mission

Deliver the science and technology necessary to ensure cyberspace superiority and support the conduct of full-spectrum, multi-domain, integrated cyber operations.

Goals

- Secure, composable, risk-based compute options
- Cyber operations integrated and on par with air & space
- Ability to conduct cyber operations agnostic to medium and geography

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

Processing and Exploitation (PEX)



PROCESSING AND EXPLOITATION



Vision

Innovator of technologies that 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 and Intelligence Community.

Mission

Deliver fast sense-making for situational awareness and adversarial insight for the AF, DoD, and Intelligence Community.

Goals

- Multi-INT correlation and fusion of massive amounts of intelligence, surveillance, and reconnaissance (ISR) and publicly available data
- Exploit targets in denied areas
- Adversarial and secure machine learning
- Dynamic, hybrid computing advancing neuromorphic, nanotech, and quantum systems to efficiently process ISR information

Exploiting Computing And Algorithms To Transform Big Data Into Information

Autonomy, Command & Control and Decision Support (AC2)



**AUTONOMY, COMMAND & CONTROL
(C2) AND DECISION SUPPORT**



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

Mastering Complexity of Multi-domain Command & Control



AFRL/RI Location Info



- ROME, NEW YORK
- 65 Acre Campus
- 30 Laboratories & Facilities
- 882,000 Sq Ft Floor Space
- Offsite specialty locations in Newport, NY and Stockbridge, NY



AFRL/RI Labs, sites and facilities



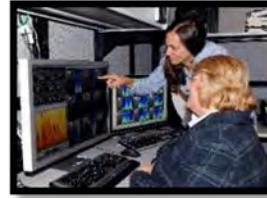
Machine Intelligence
for ISR Laboratory



Situation Awareness
Laboratory



Cyber Experimentation
Environment (CEE)



Audio Processing Lab



Operational Information
Management Lab



Integrated Intelligence
Innovation Facility (I3F)



Newport Remote Research Site



Secure Embedded High
Performance Computing



Small Unmanned Aerial System
Experimental Capability (SUAS-EC)



Command and Control
Technology Center (C2TC)



High Performance Computing Facility



Advanced Computing
Applications Laboratory



Quantum Information
Science Facility



Quantum Communications
Laboratory



Nanotechnology & Computational
Intelligence Laboratory



Corporate Collateral
Facility (CCF)



Cyber Integration &
Transition Environment



K5 Laboratory



Corporate Research and
Development Server
Facility (CRDSF)



Microwave and
Optical
Communication
Range



RF Technology Center



Cyber Operations
Technology
Facility (COTF)



Network-Centric Integration &
Interoperability Facility (NCIIF)



Command and Control
Concept Center (C2CC)



Stockbridge Remote Research Site



AFRL/RI Newport Site

Far Field, Elevated Outdoor Antenna Test Range

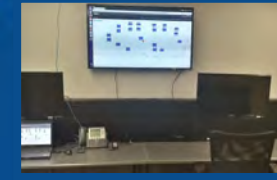
- 78 Acres
- 360° pattern measurement
- Established in 1972
- Ideal geography
- Essential measurements of the F-35 aircraft antenna patterns
- Inflatable reflector antennas for SOCOM
- 12 Commercial Test Agreements
- Aircraft and vehicle antenna performance measurements
- Critical capability for future aircraft/vehicle design and development
- Terahertz comm demonstration - provides LPI/LPD/AJ air-to-air comm links



AFRL/RI Stockbridge 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





AFRL/RI Extreme Computing Facility

A Computing Challenge Space

- Foundational advances in computing architectures
- Quantum
- Neuromorphic
- Nanoelectronic
- Machine Learning
- Artificial Intelligence





AFRL/RI Neuromorphic Computing

Brain-inspired, extremely low SWaP, intelligent computing at the-edge in dynamic & contested mission environments

- Neurosynaptic processors
- Nanoelectronics

AGILE CONDOR

- Real time situational awareness
- Neuromorphic architecture on-board
- Actionable intelligence with anomaly detection models, target recognition, and data fusion





Quantum Research at the AFRL Information Directorate (RI)



Superconducting Qubits (SCQs)

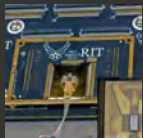
Status at Rome Labs (Started in 2019)

Installed multiple cryostats and DAQ instrumentation for operation of SCQs at milli-Kelvin temperatures
Partnering with multiple external entities on SCQs & circuitry fabrication
Demonstrated initial measurements of high performance superconducting transmon qubits



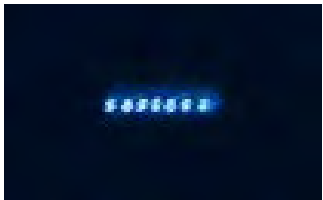
Innovare Advancement Center Partnership Opportunities

Visiting researcher/student opportunities
Quantum Software Layer Applications & Access
Heterogeneous qubit interfaces for entanglement distribution applications
Verify and validate quantum networking components – classical or quantum on heterogeneous network



Programmable Nanophotonics Processors

Developing component dense, phase stable interferometric circuits for manipulating quantum states and processing quantum information
Developing efficient methods to calibrate nested photonic devices
Transitioning devices for uses other than quantum
Neuromorphic computing NxN optical routing Classical signal encoding



Quantum Hardware Effort

Trapped Ions
Integrated Quantum Photonics
Superconducting Qubits
Heterogeneous Quantum Interfaces



Quantum Software Effort

Coding to commercial hardware & developing advanced algorithms for ML, optimization & materials discovery



Innovare Advancement Center

World-Class Facility for a Global Network of Researchers

Agility + Innovation + Partnerships

- Led by (AFRL/RI) and Griffiss Institute
- Driving Critical Innovations Accelerate Next-Gen Tech
- Advancing Artificial Intelligence/Machine Learning, Cybersecurity, and Quantum Computing
- Inspiring the Next Generation, Elevating New Talent for the Future and Beyond
- 150,000 square feet
- 13,000 square feet of Open Research Area
- Located in the Heart of New York State
- Two Leading-Edge Quantum Labs
- Event Space: Training Areas, Conference, & Breakout Rooms
- Co-Located Small Unmanned Aircraft Systems (sUAS) Site
- Two Neuromorphic/Nanoelectronics-Focused Labs





Innovare Advancement Center | *Agility + Innovation + Partnerships*

INNOVARE WILL BOLDLY...

- Build Rome's runway to the world, engaging a global community of **100 diverse partners** to introduce game-changing capabilities built in Air Force core strengths in AI/ML, cyber and quantum.
- Advance the economy with **100 entrepreneurial ventures** and tech startups.
- **Elevate by 10%, our community's intellectual leadership** in AI/ML, cyber and quantum

INNOVARE ASPIRE TECHNICAL CHALLENGES

- Neurosymbolic C2
- AI-Enabled Change Detection Non-Traditional Events
- Internet of Things (IoT) Living Laboratory
- Harnessing Weird Machines
- Multi-Source Workflow for Event Detection and Evaluation

INNOVARE OPPORTUNITIES



AFRL



BROOKHAVEN
NATIONAL LABORATORY



Google IBM





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

FY23 OPEN Agreements per AF Org per Transfer Mechanism			
AF Org	CRADA	EPA	CTA
711 HPW	2	2	
711 HPW/RH	39	5	2
AFRL/SB	128	16	1
RD	5	41	
RI	91	126	13
RQ	39	36	2
RV	14	3	1
RW	24	5	
RX	71	24	
RY	27	9	



176

Active Licenses
For FY23

FY23 OPEN Agreements
per AF Org per
Transfer Mechanism



91CRADA's
126 EPA's
13 CTA's

Information Directorate Engagements



INDUSTRY ENGAGEMENTS



ACADEMIC ENGAGEMENTS

Academic Institutions, Partnerships, EPAs, and Visiting Faculty Research Program





Academic Partnerships | Educational Partnership, CRADA & Visiting Researchers

 Air Force Academy
Arizona State University
Auburn University
Augusta University
Boise State University
Brescia University
Brown University
Carnegie Mellon University
Clayton State University
Colorado State University
 Cornell University
Dartmouth College
Duke University
Fairleigh Dickinson University
Georgia Tech
Hamilton College
Harvard University
Imperial College London
Indiana University of Pennsylvania
Iowa State University

Johns Hopkins University
Kansas State University
LaSalle University
Louisiana State University
Louisiana Tech University
Massachusetts Institute of Technology
Michigan State University
Michigan Technological University
Minnesota State University
Missouri University of Science & Technology
Montana State University
New Jersey Institute of Technology
Northeastern University
Northern Arizona University
Northwestern University
Norwich University
Oklahoma State University
Pennsylvania State University

Princeton University
 Purdue University
Rose-Hulman Institute of Technology
Rutgers – State University of New Jersey
Stevens Institute of Technology
Temple University
 Toyota Technological Institute at Chicago (TTIC)
Universidad Ana G. Mendez
University of Arkansas
University of Colorado, Denver
University of Connecticut
University of Illinois
University of Kansas
University of Maryland
University of Massachusetts, Amherst
University of Massachusetts, Dartmouth

University of Michigan
University of Minnesota, Twin Cities
University of Missouri, Kansas City
University of Nevada
University of Notre Dame
University of Oklahoma
University of Pennsylvania
University of Puerto Rico
University of Southern Alabama
University of South Carolina
University of Southern Mississippi
University of Tennessee
University of Tulsa
 University of Wisconsin - Madison
Utah State University
Vanderbilt University
Villanova University
Washington University in St. Louis
Western Michigan University

Wichita State University
Worcester Polytechnic Institute
York College of Pennsylvania

 Historically Black Colleges & Universities (HBCU)

- Central State University
- Dillard University
- Florida A&M University
- Howard University
- Monash University
- Norfolk State University
- North Carolina Agricultural & Tech State University
- Prairie View A&M
- Tennessee State University
- Texas Southern University
- Tuskegee University

 Tribal Colleges and Universities (TCU)

- Navajo Technical University

 Denotes AFRL Regional Hubs

 Denotes Centers of Excellence



K-12 STEM OUTREACH

The Air Force Research Laboratory Information Directorate K-12 STEM Outreach Program offers a variety of programs and services that effectively engage, inspire and attract the next generation of STEM talent.

PARTNERSHIP INTERMEDIARY AGREEMENT WITH THE GRIFFISS INSTITUTE TO SUPPORT ENTIRE AIR FORCE STEM PROGRAM.

SPROUT PROGRAM (NEW) 'WISH LIST' FOR TEACHERS

STEM Materials awarded to 28 teachers from the Mohawk Valley. Impacted over 8500 students locally

MID YORK LIBRARY EDUCATIONAL PARTNERSHIP AGREEMENT SIGNED.

\$1,083 worth of STEM materials/equipment donated

STEM SUMMER CAMPS

- LEGO Robotics Camp
- Cyber Summer Camp
- Arduino Camp
- Engineering Camp
- Drone Camp
- Quantum Camp
- 3-D Printer Camp (w/ SUNY)
- 17 Scholarships awarded

SUPPORTED NATIONAL PROGRAMS

- FIRST LEGO League
- FIRST Tech Challenge
- FIRST Robotics Competition
- CyberPatriot

ORGANIC PROGRAMS

- Annual Challenge Competition
- Staying Safe Online Workshop

ORGANIC PROGRAMS

- Take Your Student to Work Day
- Lab Tours
- Teacher Professional Development
- DoD DimensionU Math Video Game Tournament
- Central New York Hackathon

STUDENTS IMPACTED

EDUCATORS IMPACTED

SCHOOL INVOLVED

HOURS OF STEM ACTIVITIES

34+

38+

1,200+

1,450+





INFORMATION DIRECTORATE

Global Persistent Awareness
Resilient Information Sharing
Rapid, Effective Decision-Making
Complexity, Unpredictability, and Mass
Speed and Reach of Disruption and Lethality

Building a more lethal force – modernizing key capabilities

Strengthening our alliances and attracting new partners

Reforming our organization for greater performance and affordability

- Innovating at speed
- Employing rapid, iterative approaches for development → fielding



WE UNDERSTAND THE URGENT NEED TO “OUT-THINK, OUT-MANEUVER, OUT-PARTNER, AND OUT-INNOVATE...”
THE AIR FORCE RESEARCH LABORATORY



INTERACTIVE SESSION

ACADEMIA

- Grants
- Partnerships

INTERNAL

- Department of the Air Force Challenge
- AFWERX Spark Program
- AFRL CC's Challenge

SMALL BUSINESS

- Open Innovation Challenges
- Tech Accelerators
- AFRL's Innovation Institutions
- IP Licensing
- Small Business Innovation Research (SBIR)



For more information visit

[AFRESEARCHLAB.COM](https://afresearchlab.com)



SCAN ME

INDUSTRY

- AFRL Institutes
- AFWERX, SpaceWERX
- AFVentures
- Open Solicitations
- beta.sam.gov
- Defense Innovation Marketplace

Partnering with AFRL