



Air Force Research Laboratory - Mission Review and Partnering Opportunities

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Who We Are

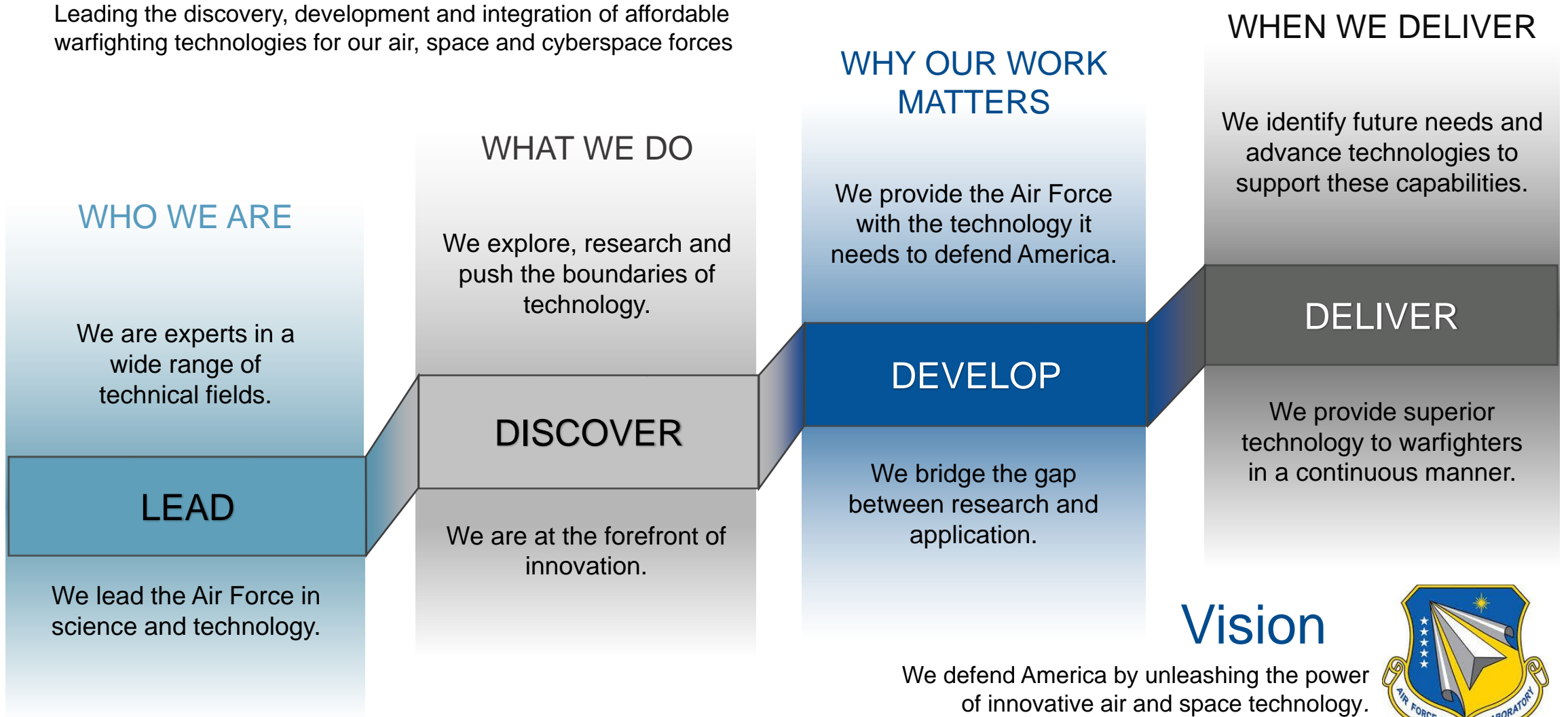
At a Glance



- The Air Force Research Laboratory (AFRL) is **the primary scientific research and development center** for the Air Force.
- AFRL Headquarters is located at Wright-Patterson Air Force Base, Ohio.
- Created in October **1997** through the consolidation of four former Air Force laboratories and the Air Force Office of Scientific Research (AFOSR).
- **Workforce: 11,000** employees (military, government civilians and contract positions)
- AFRL develops affordable warfighting technologies and delivers innovative solutions that **keep the fight unfair**.
- **Budget:** AFRL executes \$5.0B in funding.
- **Locations** in **9** States: California, Florida, Hawaii, New Mexico, New York, Ohio, Tennessee, Texas and Virginia.
- International Sites in **3** Countries: The United Kingdom, Japan and Chile.
- **History: 100+** years of critical research efforts for the Air Force and the Department of Defense (DoD).

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.



Personnel

TYPES OF EMPLOYEES



1,200 ... **Military**

5,100 ... **Civilians**

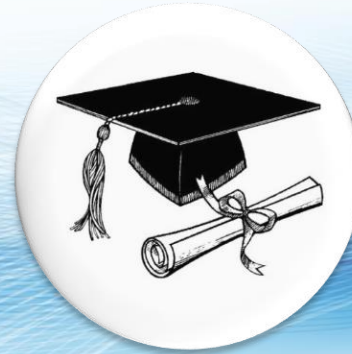
~ 4,700 ... **Contracted Positions**

SCIENTISTS & ENGINEERS (S&Es)



Three out of every five government civilians are S&Es

EDUCATION



70% of S&Es hold a Master's degree or higher
36% hold a Ph.D.

BUSINESS PROFESSIONALS



Program Management
Finance, Contracting,
Acquisition, Security,
Information Technology
and many more...



Executive Director
Mr. Jack Blackhurst




Chief Technology Officer
Dr. Timothy Bunning



AFRL 
Commander
Brig Gen
Evan C. Dertien



Vice Commander
Col Paul Henderson




Command Chief
CMSgt Kennon Arnold




711th Human Performance Wing 
Brig Gen James Dienst



Wing/TD Directors

Airman Systems
Dr. Kevin Geiss




Aerospace Systems
Dr. Michael Gregg





Munitions
Col Garry Haase




Strategic Development Planning & Experimentation
Mr. Christopher Ristich





Human Systems Integration
Col Phillip Preen





Materials & Manufacturing
Mr. Timothy Sakulich




Sensors
Ms. Jacqueline Janning-Lask



Information
Dr. Mike Hayduk (acting)



USAF School of Aerospace Medicine
Col Theresa Goodman




Air Force Office of Scientific Research
Col Michelle Ewy (acting)




Directed Energy
Dr. Kelly Hammett




Space Vehicles
Col Eric Felt






Executive Director
Mr. Jack Blackhurst




Chief Technology Officer
Dr. Timothy Bunning



AFRL 

Commander
Brig Gen
Evan C. Dertien



Vice Commander 

Col Paul Henderson



Command Chief 

CMSgt
Kennon Arnold




Strategic Development Planning & Experimentation

Dr. Greg Spanjers




Chief Scientists



Aerospace Systems

Dr. Siva Banda




Munitions

Dr. David Lambert


711th Human Performance Wing

Dr. Rajesh Naik




Materials & Manufacturing

Dr. Richard Vaia (acting)






Sensors

Dr. Michael Eismann




Information

Dr. Paul Antonik

Systems Technology

Dr. Stephen Schneider




Air Force Office of Scientific Research

Dr. Qing Wu (acting)




Directed Energy

Dr. Donald Shiffler, Jr.




Space Vehicles

Dr. Thomas Cooley




Locations by State



What We Do

Core Technical Competencies (CTC)

MATERIALS & MANUFACTURING



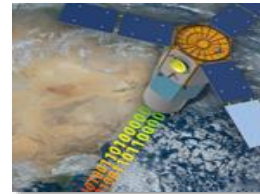
Structural Materials, Functional Materials, Manufacturing Technology, Support of Operations

HUMAN PERFORMANCE



Training, Adaptive Warfighter Interfaces, Bioeffects, Aerospace & Operational Medicine, and Bioengineering; Aerospace & Operational Medicine education, training, and consultation; Human Systems Integration analysis and implementation

SPACE VEHICLES



Space Environment, Advanced Space Resilience Technologies, Space Communication & Navigation Technologies, Space Awareness and Command & Control

INFORMATION



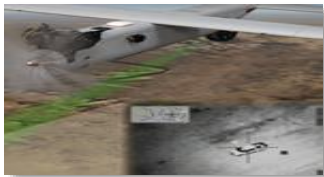
Processing & Exploitation, Connectivity & Dissemination, Autonomy, Command & Control and Decision Support, Cyber Science and Technology

BASIC RESEARCH



Engineering & Information Sciences, Physical & Biological Sciences

SENSORS



Radio Frequency (RF) Sensing, Electro Optical (EO) Sensing, Spectrum Warfare, Trusted & Resilient Mission Systems, Multi-domain Sensing, Autonomy, Enabling Sensor Devices & Components

AEROSPACE SYSTEMS



Aerospace Vehicles, Control, Power & Thermal Management, High Speed Systems, Rocket Propulsion, Turbine Engines

DIRECTED ENERGY



Laser Systems, Weapons Modeling, Simulation & Analysis, High Power Electromagnetics (HPEM), Directed Energy and Electro Optics for Space Superiority

MUNITIONS



Munitions Airframe, Guidance, Navigation & Control, Terminal Seeker Sciences, Modeling & Simulation, Evaluation Sciences, Ordnance Sciences

EXPERIMENTATION



Capability & Technology Prototyping

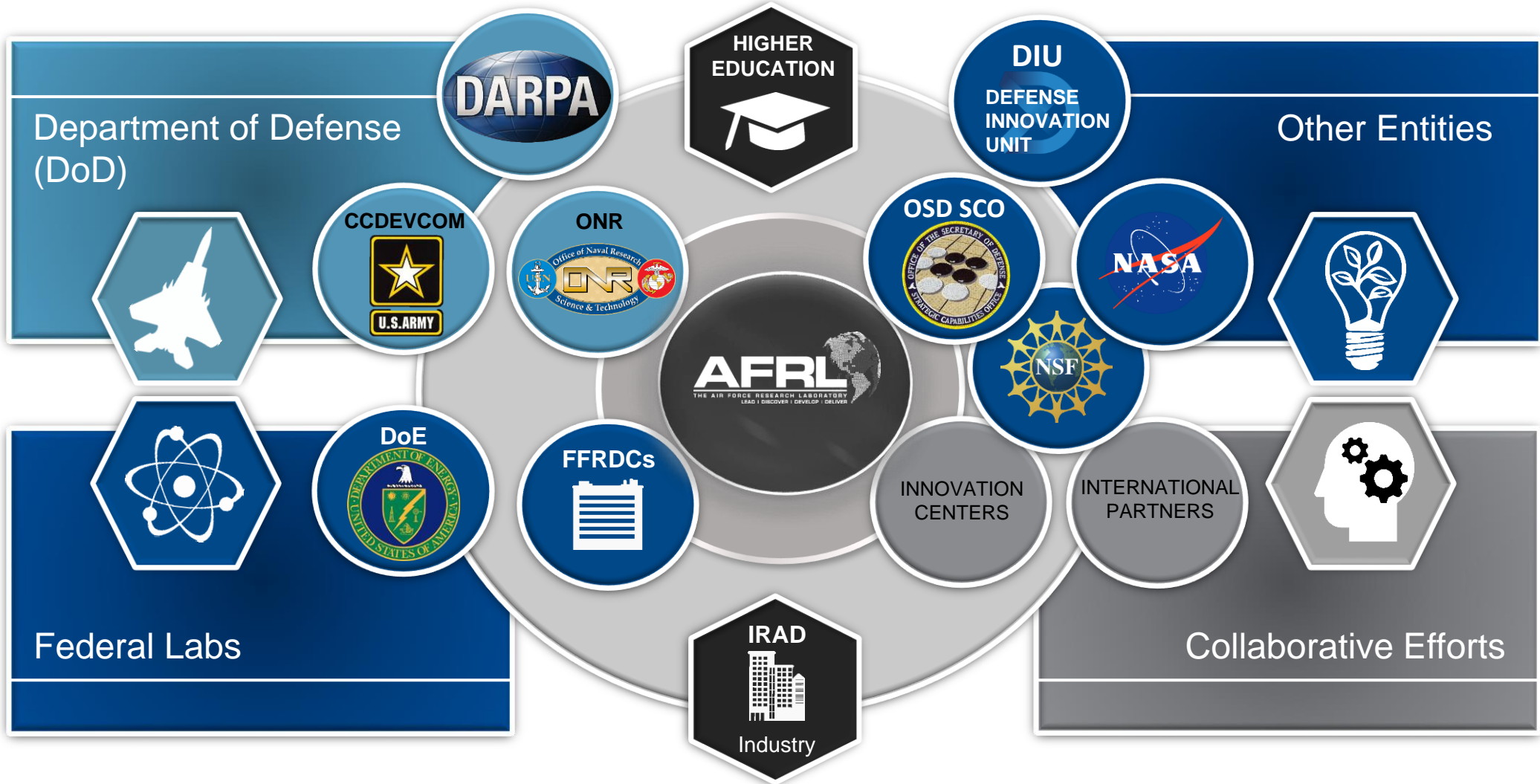
Science & Technology (S&T) Planning

A GUIDED, PROCESS-DRIVEN EFFORT



Rigorously Vetted – Air Force Level Investments

Science & Technology (S&T) Ecosystem



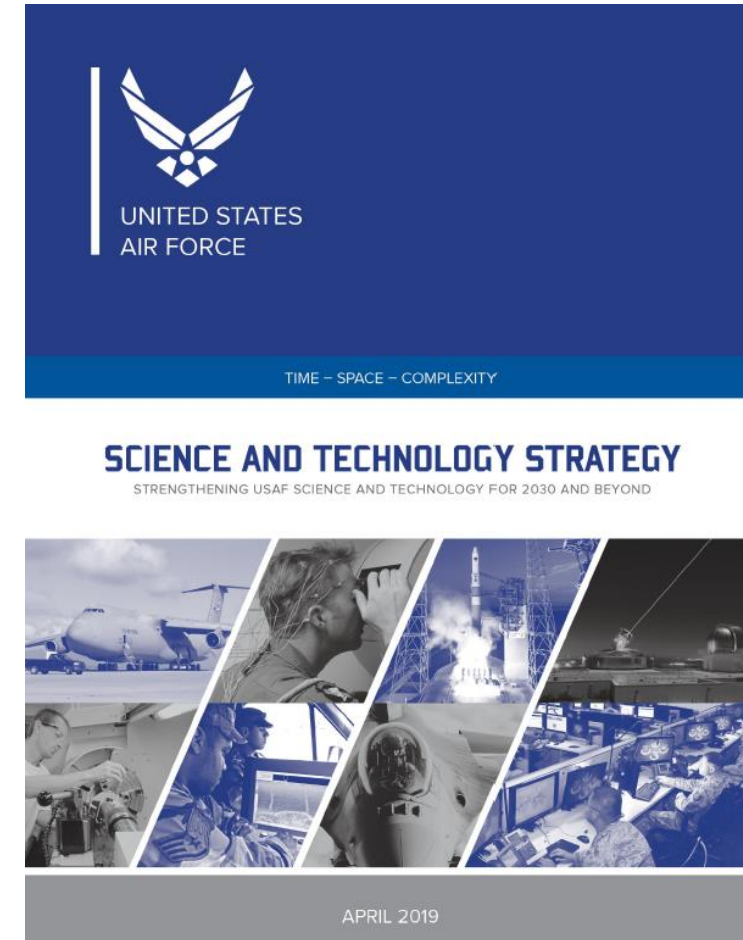
Air Force Science and Technology Strategy

The Science & Technology Strategy for 2030 and Beyond

An Air Force that dominates time, space, and complexity across all operating domains

The Science & Technology Strategy released in April 2019, is divided by three key objectives and supporting reforms:

- Objective 1: Develop and Deliver Transformational Strategic Capabilities
- Objective 2: Reform the Way Science and Technology is Led and Managed
- Objective 3: Deepen and Expand the Scientific and Technical Enterprise



Build a more lethal force, strengthen alliances and attract new partners, reform the U.S. DoD for greater performance and affordability.

Develop and Deliver Transformational Strategic Capabilities



- Identifies two components in the AF S&T portfolio:
 - (1) a broad-based, enabling and enduring component addressing current gaps/needs
 - (2) a focused transformational component driving future force design
- Establish 20% of S&T budget to fund transformational portfolio programs (“Vanguards”) driven by strategic capabilities
- Construct an independently managed, enterprise-level, competitive and cross-disciplinary organization structure to manage the transformational portfolio
- Develop the future force and transformational S&T components through sustained collaboration between the AF S&T enterprise, operational stakeholders, and the Air Force Warfighting Integration Capability (AFWIC) office
- Transformational component guided by five strategic capabilities to dominate time, space, and complexity across all domains:
 - Global Persistent Awareness
 - Resilient Information Sharing
 - Rapid, Effective Decision-Making
 - Complexity, Unpredictability and Mass
 - Speed and Reach of Disruption and Lethality



Transformational Strategic Capability Areas

Global Persistent Awareness

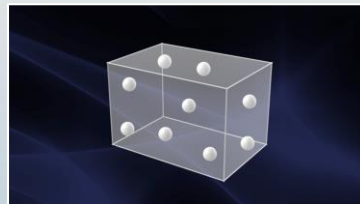


Continuous and timely **knowledge of adversaries** throughout the operating environment

Cyber intelligence, surveillance & reconnaissance

Microelectronics, photonics and related materials

Resilient Information Sharing



Coordinate across all **Joint Force assets** through assured communications & precise positioning, navigation and timing information

Quantum science

Software-defined, agile systems with real-time spectrum awareness

Rapid, Effective Decision-making



Increase the speed of **battlespace understanding** and decision-making to **act faster than any adversary**

Artificial intelligence: machine learning, machine-based reasoning

Autonomous electronic and cyberwarfare agents

Complexity, Unpredictability & Mass



Overwhelm adversaries through a collaborative and autonomous network of systems and effects

Collaborative autonomy and swarming

Agile digital and additive manufacturing

Speed & Reach of Disruption, Lethality



Rapidly disrupt and neutralize dynamic and mobile targets using new methods to **attack with speed and global reach**

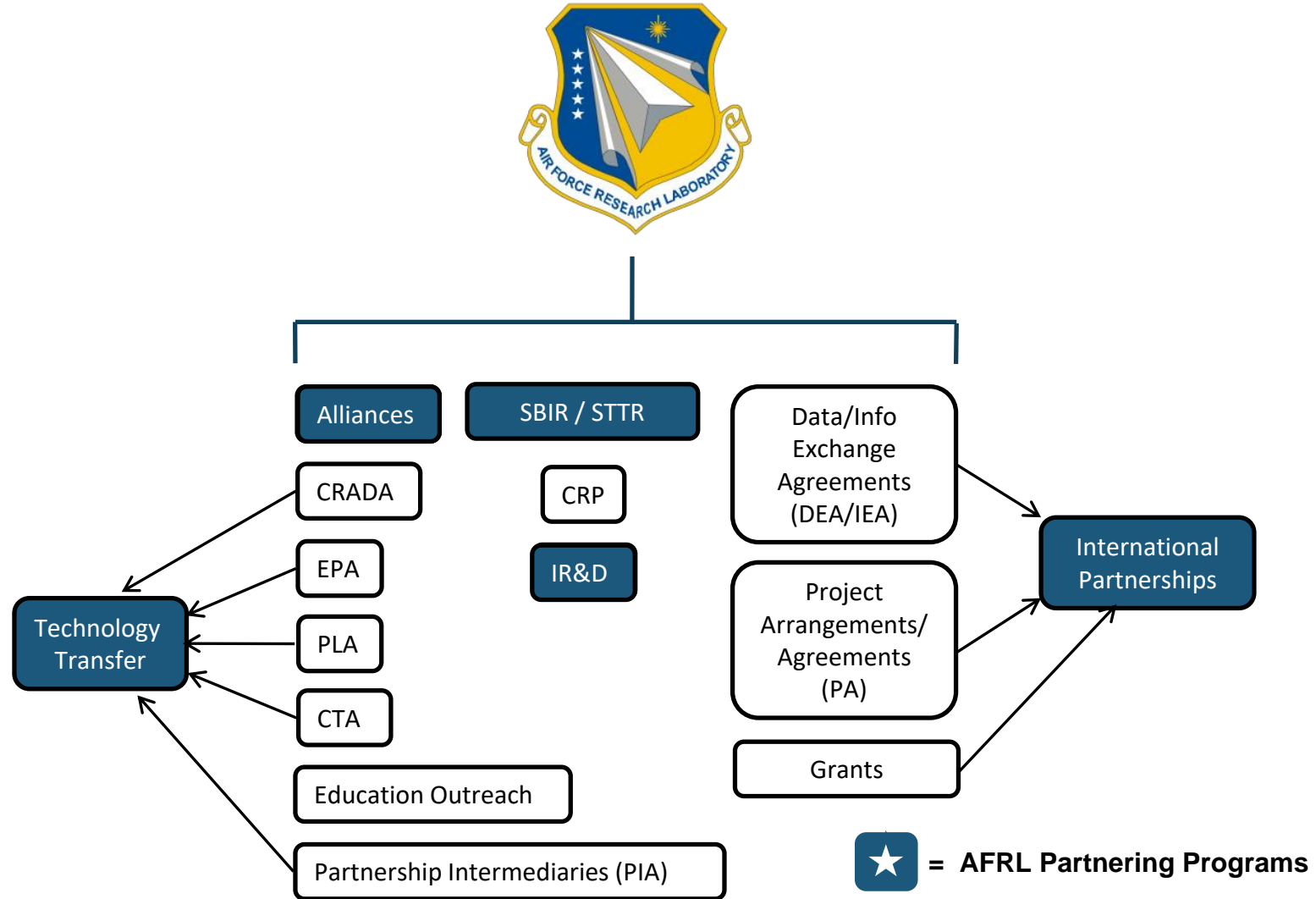
Hypersonic flight

Networked cruise missiles and smart munitions

Microwave and laser-directed energy

Partnerships and Teaming Opportunities

AFRL Partnership Programs



AFRL Mission Driven Execution of Partnership Programs

“Leading the discovery, development, and integration of affordable warfighting technologies for our air, space and cyberspace force.”

- **AFRL Commander manages & executes AF S&T programs on behalf of the Air Force**
- **AFRL administers Partnership Programs as an integral part of its technology development mission**
- **AFRL Commander leads the international portfolio**

Technology
Transfer

Alliances

SBIR / STTR

IR&D

International
Partnerships

Partnering with AFRL

For more information, visit AFRESEARCHLAB.COM

ACADEMIC PARTNERS *CONNECTS WITH* **AIR FORCE OFFICE OF SCIENTIFIC RESEARCH**

- Grants
- Partnerships

INTERNATIONAL PARTNERS

- Gov-to-Gov Information Exchange
- Gov-to-Gov Projects
- Global Presence
- Engineer Scientist Exchange Program
- WOS / WOW Program

INTERNAL AIR FORCE PARTNERS

- Air Force Challenge
- AFWERX Spark Program
- AFRL Maker Hub
- AFRL CC's Challenge

WAYS TO PARTNER WITH AFRL

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

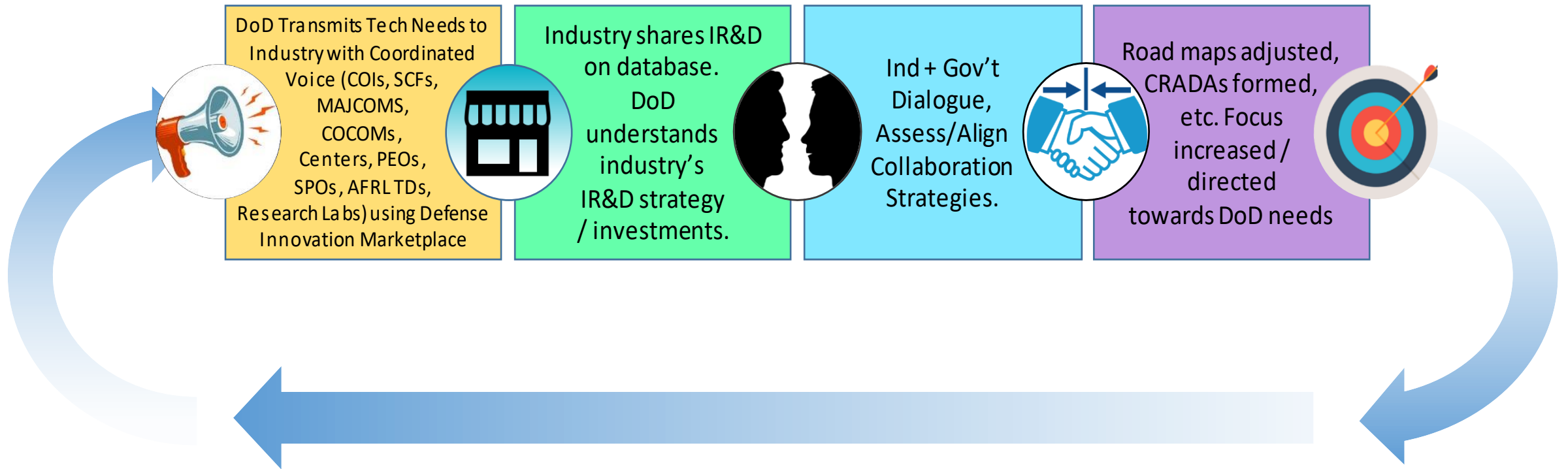
SMALL BUSINESS PARTNERS *CONNECTS WITH* **AFRL SMALL BUSINESS OFFICE**

- AFRL Institutes
- AFWERX
- Open Solicitations
- FedBizOpps.gov
- Defense Innovation Marketplace

INDUSTRY PARTNERS

Air Force IR&D Model

IR&D Technology Interchange Model



AFRL International Partnerships

Vision

Enable global technology awareness, support international engagement and collaboration, and build strong international S&T relationships.

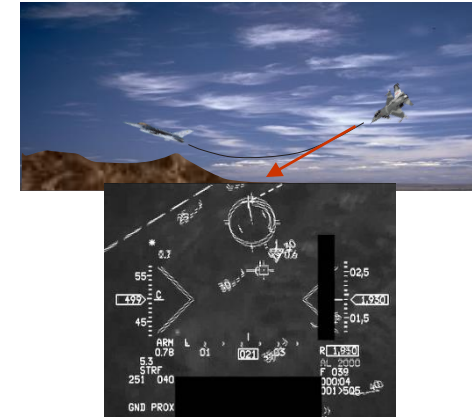
Mission

Identify and **leverage** the best global S&T to help solve Air Force and DoD technology needs.



AFRL International Partnerships

- **Align program with National Defense Strategy and the Air Force S&T 2030 Strategy**
 - Enhance global awareness to utilize resources, facilities, equipment, and the best S&T global talent to benefit USAF & Partner Countries
- **Engage in collaborative programs to leverage the best international research to solve Air Force and DoD S&T needs**
 - Government to Government Agreements
 - 63 active project agreements (PAs) and 45 information exchange agreements (IEAs) with 17 partner nations – addressing Big Bets and key technology areas
 - 36 PAs & 8 IEAs in development or staffing
- **Global presence - place personnel in hotspot locations by using the Engineering Scientist Exchange (ESEP) program**
 - Traditional ESEP ~ 1-2 yrs, builds and maintains cooperative relationships w/ partners
 - AFRL Short Term Exchange Program (STEP) – supports mutually determined technology areas for shorter periods of time - < 6 months



Snapshot of AFOSR

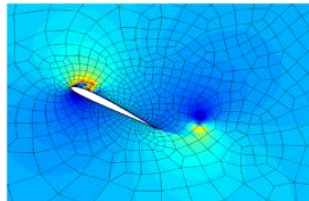
Discover, shape, and champion basic science that profoundly impacts the future Air Force

- **Manage the basic research investment for the Air Force**
 - Basic research is the foundation of all scientific discovery
 - Leads to revolutionary new concepts & technology
- **Find and fund the most dynamic & promising world-class researchers in academia, industry, & government**
 - 325 intramural research projects at AFRL
 - 1215 research grants at 209 U.S. universities in 47 states
 - 348 research grants in 33 countries in 5 continents
- **Ensure timely transitions of research results**
 - Offer significant benefits to national warfighting and peacekeeping capabilities, and society at large



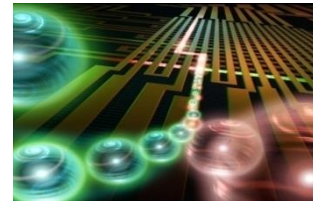
AFOSR Research Departments

Dynamical Systems & Control



Dynamics & Control
Computational Mathematics
Optimization & Discrete Mathematics
Test & Evaluation
Flow Interactions & Control
Multi-Scale Structural Mechanics & Prognosis
Turbulence & Transition

Quantum & Non-equilibrium Processes



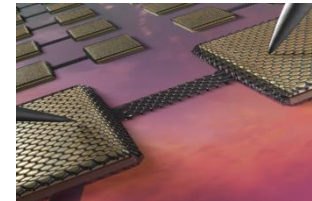
Atomic & Molecular Physics
Plasma & Electro-Energetic Physics
Remote Sensing & Imaging Physics
Space Sciences
Electromagnetics
Ultrashort Pulse Laser-Matter Interactions
Biophysics
Laser & Optical Physics

Information, Decision, & Complex Networks



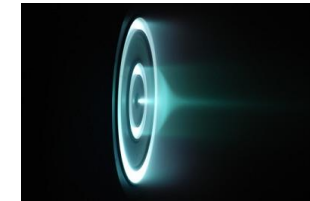
Systems & Software
Complex Networks
Dynamic Data-Driven Application Systems
Information Operations & Security
Trust & Influence
Robust Decision Making in Humans
Science of Information, Computation & Fusion
Mathematical & Computational Cognition
Robust Computational Intelligence

Complex Materials and Devices



Natural Materials & Systems
Low Density Materials
GHz-THz Electronics
Mechanics of Multi-functional Materials & Microsystems
Organic Materials Chemistry
Optoelectronics & Photonics
Aerospace Materials for Extreme Environments
Quantum Electronic Solids

Energy, Power, and Propulsion

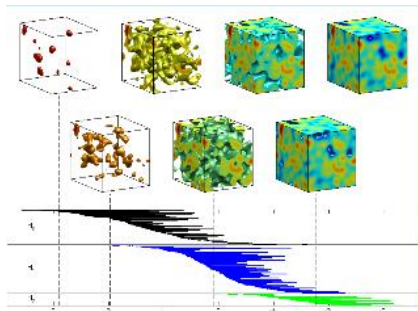


Molecular Dynamics & Theoretical Chemistry
Space Power & Propulsion
Human Performance & Biosystems
Energy Conversion & Combustion Sciences
Aerothermodynamics & Turbulence
Dynamic Materials & Interactions

Research Areas

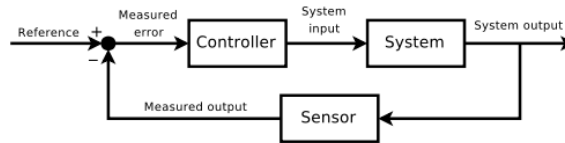
AFOSR International Programs

Awareness



Read article on recent Work in Stochastic Algebraic Topology and Applications

Engagement



Conference Support for Symposium on Estimation, Navigation, and Spacecraft Control

Relationships



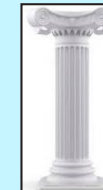
Develop collaborative scientific exchanges with AFRL/U.S. institutions

TOOLS

- AF/DoD S&T Priorities / Interests
- Conference Attendance
- Exploratory Visits
- Journal Articles



- Windows on Science
- Windows on the World
- Grants / Co-funding
- Conference Support Program
- Regional Initiatives



- Program Reviews
- Research Facilities
- Global Connections
- Joint Publications
- ESEP Exchange Support

Support long-term basic research – scientific impact, unique approaches
 Expect publication in high quality journals
 Support collaborative research with AFRL scientists and engineers

AFRL Partnerships Points of Contact

– more info at <https://afresearchlab.com>

- **Basic Research for US and International Universities Partnerships**

Higher Education inquiries: collaborate@us.af.mil

AFOSR International Offices Commander – Col D. Brent Morris, Ph.D.

North America – Arlington - Dr. Thomas Kim

Asian Office of Aerospace R&D – Dr. Jermont Chen (afosr.aord@us.af.mil)

Southern Office of Aerospace R&D – Lt Col Daniel Montes, Ph.D. (theamericas@us.af.mil)

European Office of Aerospace R&D – Col D. Brent Morris, Ph.D.

- **AFWERX:** support@afwerx.af.mil

- **Small Business inquiries:** afsbirsttr-info@us.af.mil

- **Gov-to-Gov Domestic and International Partnerships inquiries:**
afrl.xpp.off.acc@us.af.mil

Questions