Air Force Research Laboratory

Integrity ★ Service ★ Excellence

Science & Technology Game Changers

18 April 2012

Major General William N. McCasland
Commander
Air Force Research Laboratory

AFRL

AFRL Mission

AFRL Organization

Commander

Maj Gen William N. McCasland

Executive Director

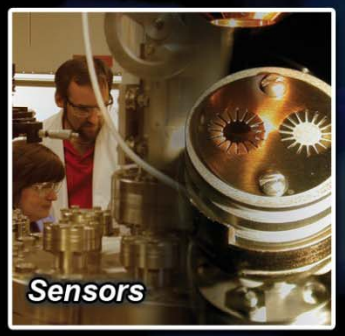
Mr. Joe Sciabica

Vice Commander

Col Daniel Morin

Chief Technology Officer

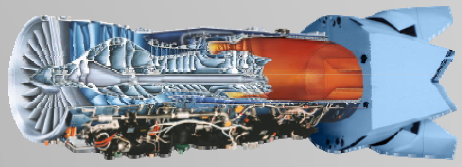
Dr. Jennifer C. Ricklin



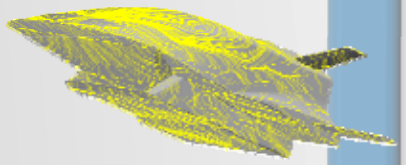
AFRL Technology Focus Areas

Next Gen Air


Adv Turbine Materials


Turbine Sustainment

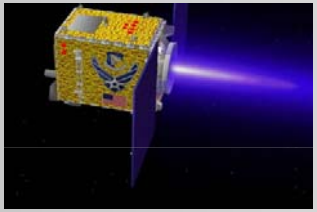

Adaptive Engine


Hypersonics

Space


ICBM Guidance


ICBM Sustainment SRM Tech


ANGELS


Hydrocarbon Boost


STP-2 Experiment

5th & 6th Gen Weapons

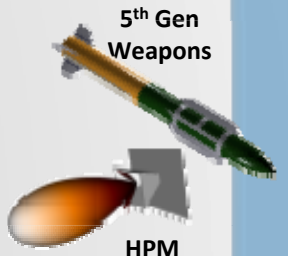

CHAMP JCTD


Hypersonic Cruise Missile Demo


High Velocity Penetrating Weapon


Anti-Jam Precision Guided Munition JCTD


DLWS



HPM

Basic Research

AFRL Technology Focus Areas

C2 / ISR & Cyber

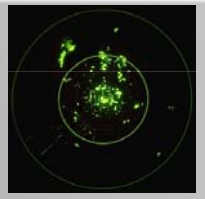

Ground SSA


Space Comm



Cyber

Electronic Warfare / Electronic Protection

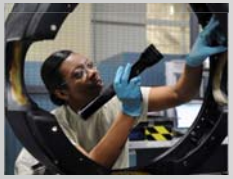
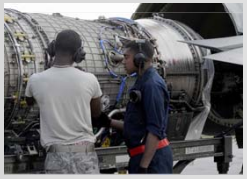

EW Plus


Distributed EW


IR countermeasures

Affordability & Sustainment


MANTECH



Sustainment


Energy/Fuels

Human Performance



Autonomy


Aerospace Physiology

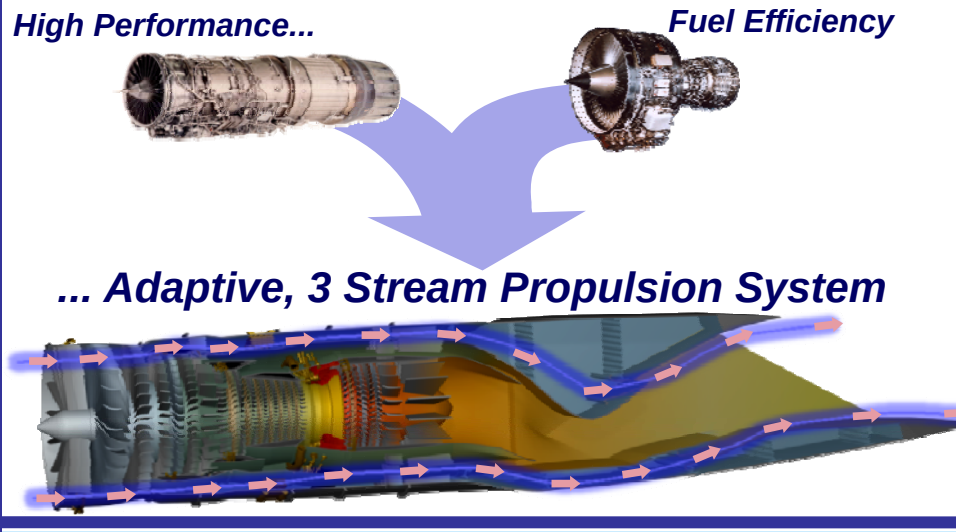
Basic Research

Command & Control/Intelligence, Surveillance, and Reconnaissance (C2/ISR)

ADaptive Versatile ENgine Technology (ADVENT)

Goals

- Improve fuel efficiency (+25%) through demonstration and maturation of adaptive turbine engine technologies that optimize performance over all flight conditions
- Increased power/thermal capacity enables 2x low altitude persistence
- 1.5B gal fuel savings through 2040
- OSD - accelerate maturation of competitive adaptive engine technologies



Programs

- **Preliminary design of adaptive engine technology development**
- **Risk reduction of critical engine components**
- **Maturation of an engine core**
- **Sub- & full-scale ground rig & engine testing**
- **Engine integration**
- **Technology development and integration**
- **Analysis of uninstalled and installed engine performance**
- **Analysis of operational benefits**

Resources

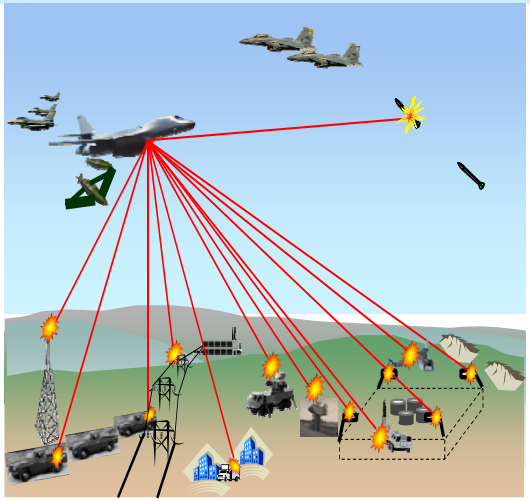
Primary proposed funding sources ($M):

BA	FY13	FY14	FY15	FY16	FY17
6.2	118.1	89.4	55.1	55.4	56.7
6.3	112.5	111.3	70.7	87.5	87.5

5th and 6th Generation Weapons

Goals

- Increased Capability/Capacity; Future Threat-Aware Approach
- Highly Contested Airspace – Anti Access / Area Denial
- Optimizing 5th/4th Gen Mixed Capabilities
- GPS Degraded / Denied Environments
- Understand w/Warfighter the Value of Speed in all Airspace
- Sensors Forward Optimization for Targeting/Integrated Secure Comm
- DE /Non Kinetic Effects – Forward (NKE-F)
- Enhanced Lethality Warheads & Effects
- Cooperative Effects – Time Synched? Geo-Synched?



Programs

- High Velocity Penetrating Weapon
- Next Generation Missile
- Small, Advanced Capability Missile
- High Speed Strike Weapon
- Low Cost Mini Cruise Missile
- Anti-Jam Precision Guided Munition JCTD
- Cooperative Engagement, Networked Lethal UAVs
- Tactical and Strategic LASER weapons
- CHAMP

Resources

Primary proposed funding sources ($M):

PE	FY13	FY14	FY15	FY16	FY17
6.1	32.5	34.4	34.1	32.3	36.1
6.2	183.3	199.9	213.5	208.0	211.1
6.3	55.4	54.0	77.6	81.7	83.3

Autonomy

Goals

- Develop UAS/RPA teaming technology for goal-directed behavior in contested environments
- Improve the man-machine interface to reduce operator/analyst fatigue, workload, and stress
- Transition sense-and-avoid (SAA) and automated aerial refueling (AAR) autonomy technology
- Flexibly set appropriate level of trust in autonomous systems to reduce error, increase confidence, and increase transparency
- Align with OSTP and ASD(R&E) Big Data Grand Challenge

Machines seamlessly integrated with humans – AFRL Technology augmenting humans where needed, replacing humans where desired

Programs

- Teaming of Autonomous Systems (Collaborative Systems Control / Autonomy for Contested Environments)
- Human-to-Machine Teaming (Human Interaction w/ Adaptive Automation, Supervisory Control)
- Machine Perception, Reasoning and Intelligence (Adaptive Guidance & Control, Text Understanding)
- Testing and Evaluation, Verification and Validation (Hardware in-the-loop Test Tech, Autonomous Sys V&V)

Resources

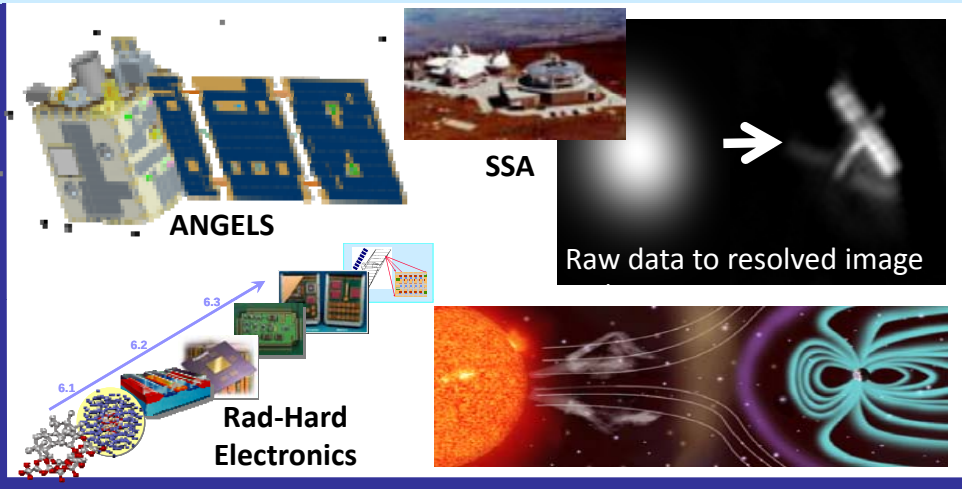
Primary proposed funding sources ($M):

BA	FY13	FY14	FY15	FY16	FY17
6.1	23.3	24.9	25.2	25.9	26.7
6.2	62.6	62.6	54.1	42.5	37.3
6.3	17.2	15.9	13.0	10.8	8.9

Space

Goals

- Predict & Mitigate environmental effects on space-based missions
- Forecast space impacts on Communications and Navigation Sys
- High performance and radiation hardened space electronics
- Ground- and space-based space situational awareness, including close proximity
- Lower space platform & operations costs



Programs

- M&S for space weather forecasting, space hazard tracking, on-orbit flight planning and space vehicle design
- Advanced technologies for PNT
- New sensors, electronics and materials for the extreme environment
- Advanced Inertial Measurement Unit development for increased reliability
- ANGELS, STP-2, and EAGLE flight experiments

Resources

Primary proposed funding sources ($M):

BA	FY13	FY14	FY15	FY16	FY17
6.1	32.7	35.1	34.8	35.9	36.7
6.2	98.4	109.6	117.3	117.3	117.3
6.3	64.6	61.7	67.1	55.0	56.9

Legacy of War-Winning Technology Development