

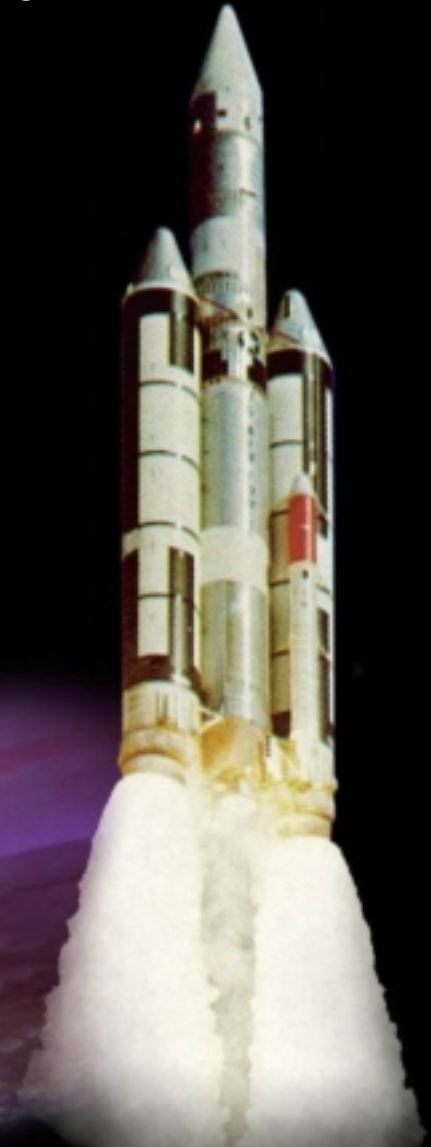


Propulsion Directorate

Propulsion & Power for the
21st Century Warfighter



**Opportunities
For Innovative
Collaboration**





Propulsion Directorate

Our Mission

**Create and transition advanced air breathing
and rocket propulsion and power technologies
for military dominance of air and space**

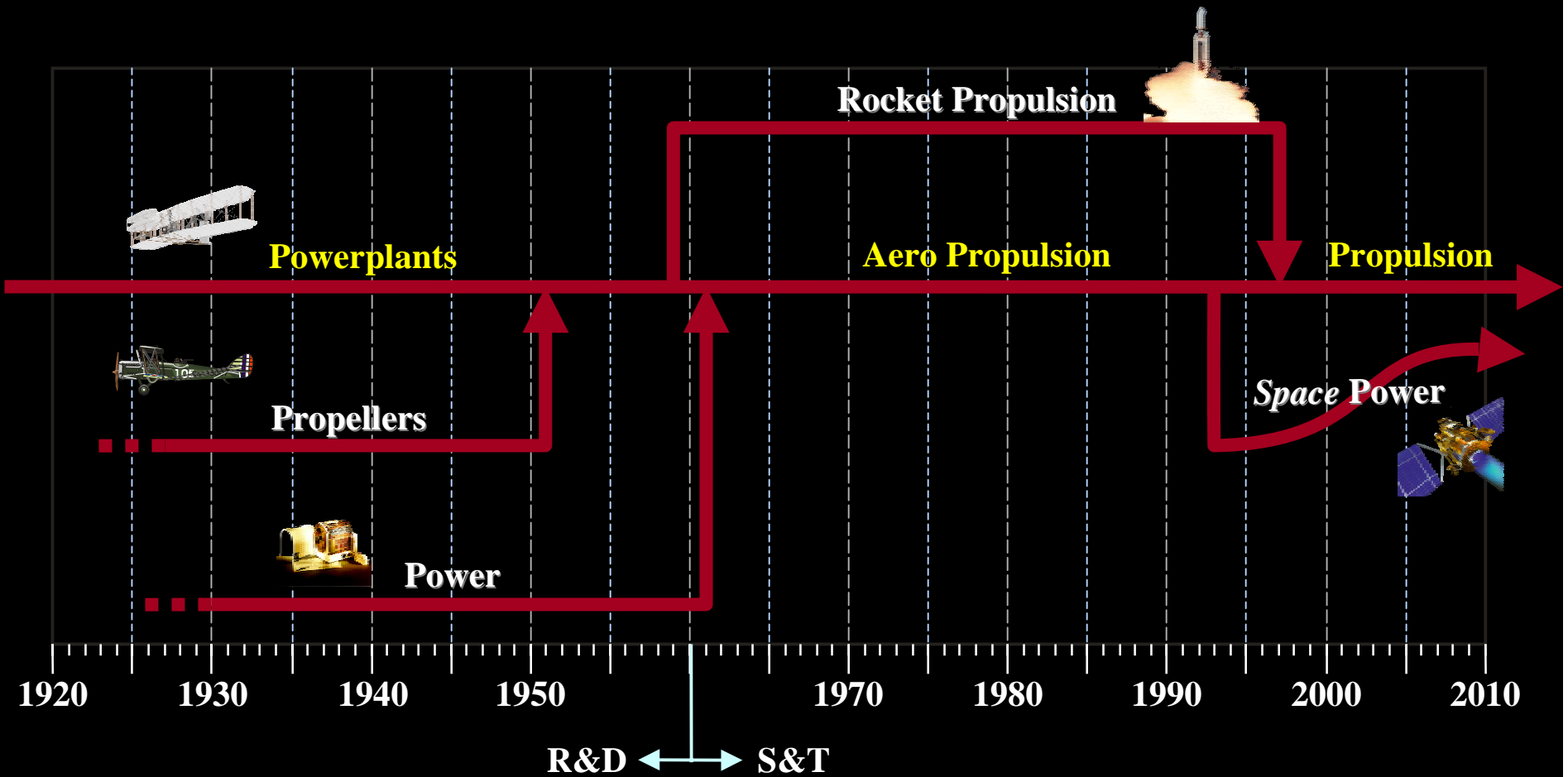
Our Vision

**We will continue to be the world leaders in
military propulsion and power technology**



Propulsion Directorate

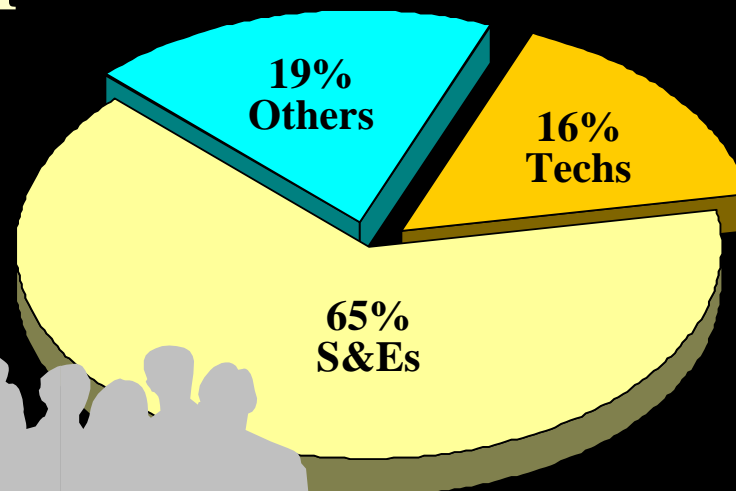
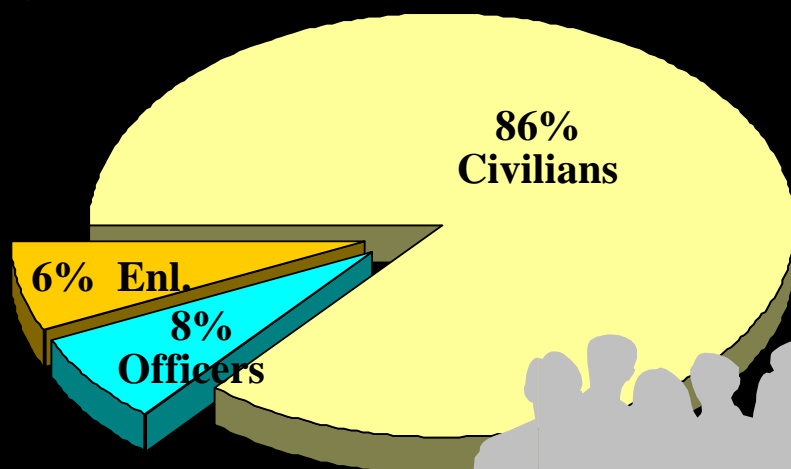
Our Legacy & Our Future



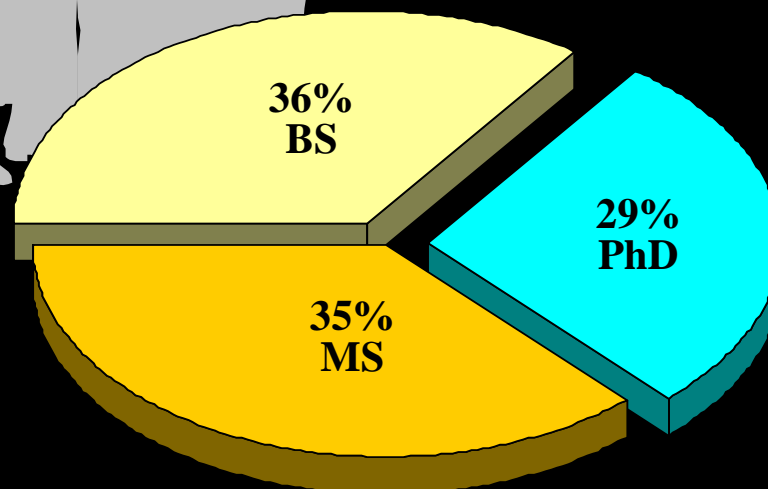
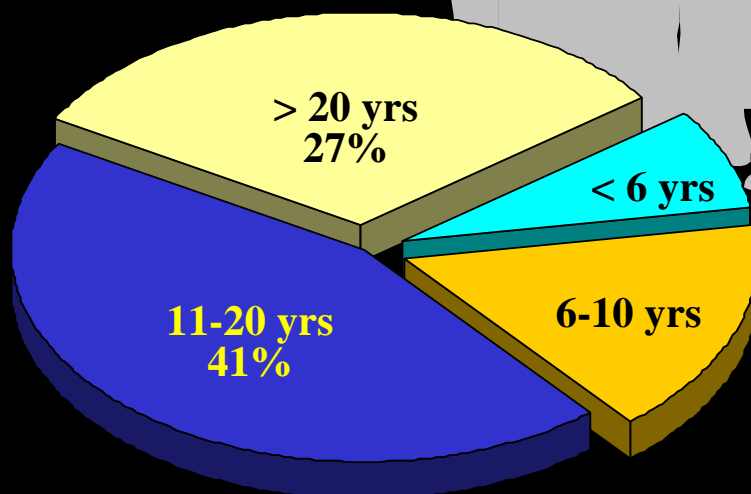


Propulsion Directorate

Our People

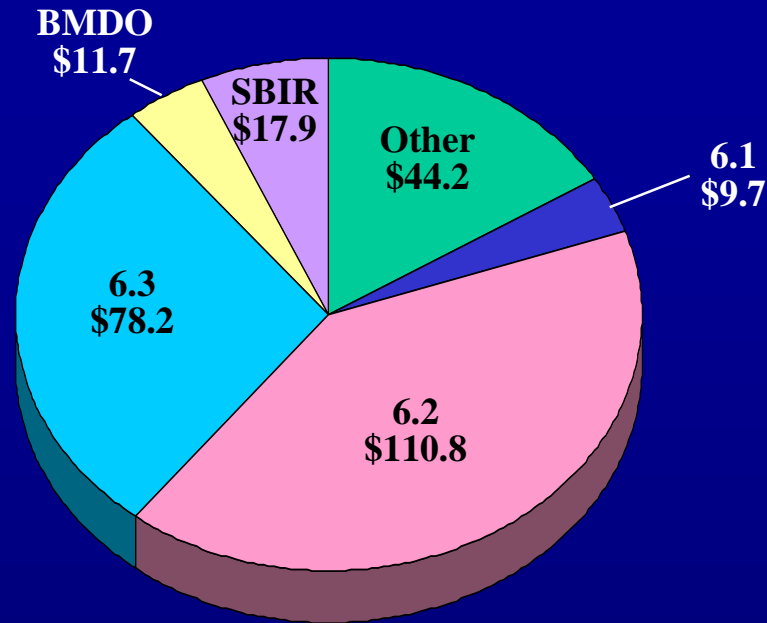


513 Government People
(plus 477 on-site contractors)





Propulsion Directorate Funding



FY99

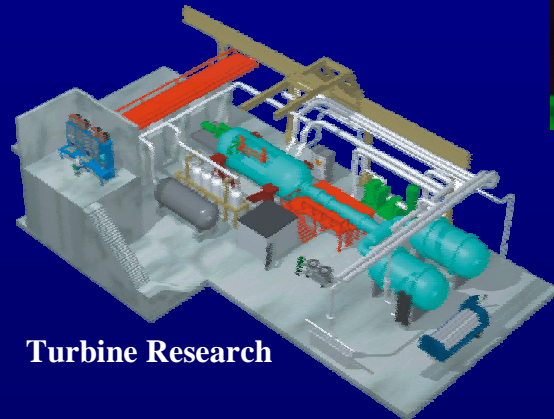
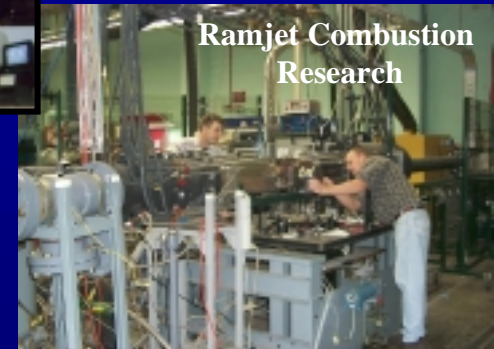
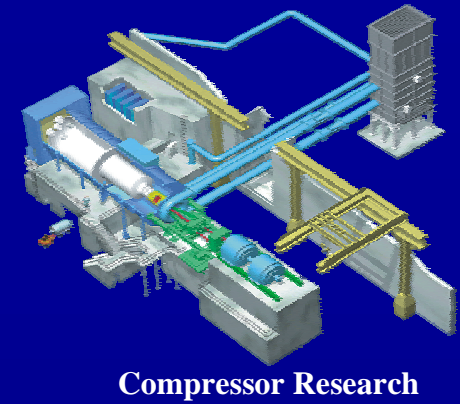
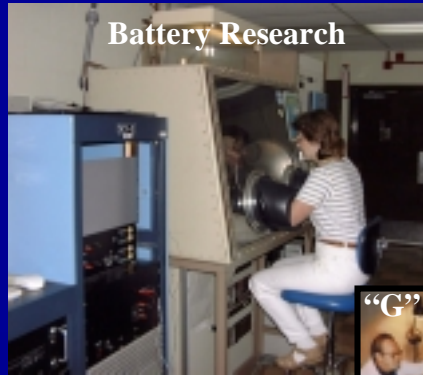
Science & Technology	\$198.7 M
Other Funding	\$ 73.8 M

Total	\$272.5 M
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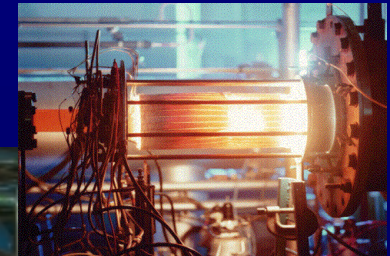
FY00

Science & Technology	\$203.7 M
Other Funding	\$ 48.0 M

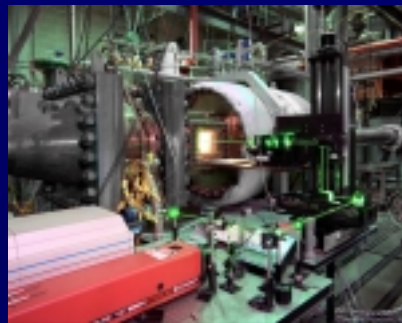
AFRL's PR-East Facilities



Scramjet Combustor Research



High Temperature Combustor



High Pressure Combustion Research

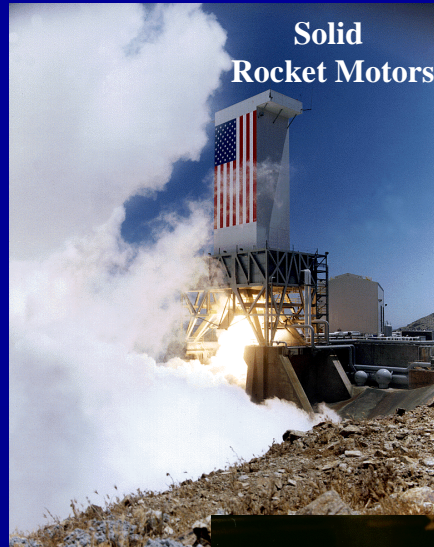


Altitude Simulation Compressor

AFRL's PR-West Facilities



X-33 Sub-scale Engine



Solid
Rocket Motors



Advanced Liquid
Engine Research



Solid/Liquid
Propellant Research



Arcjet Engine



Advanced Liquid
Engine Research



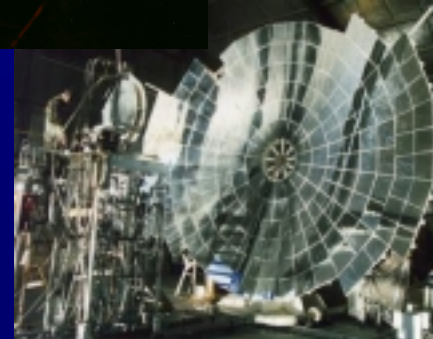
National Hover
Test Facility



Space Environmental Propulsion



X-33 Launch Complex



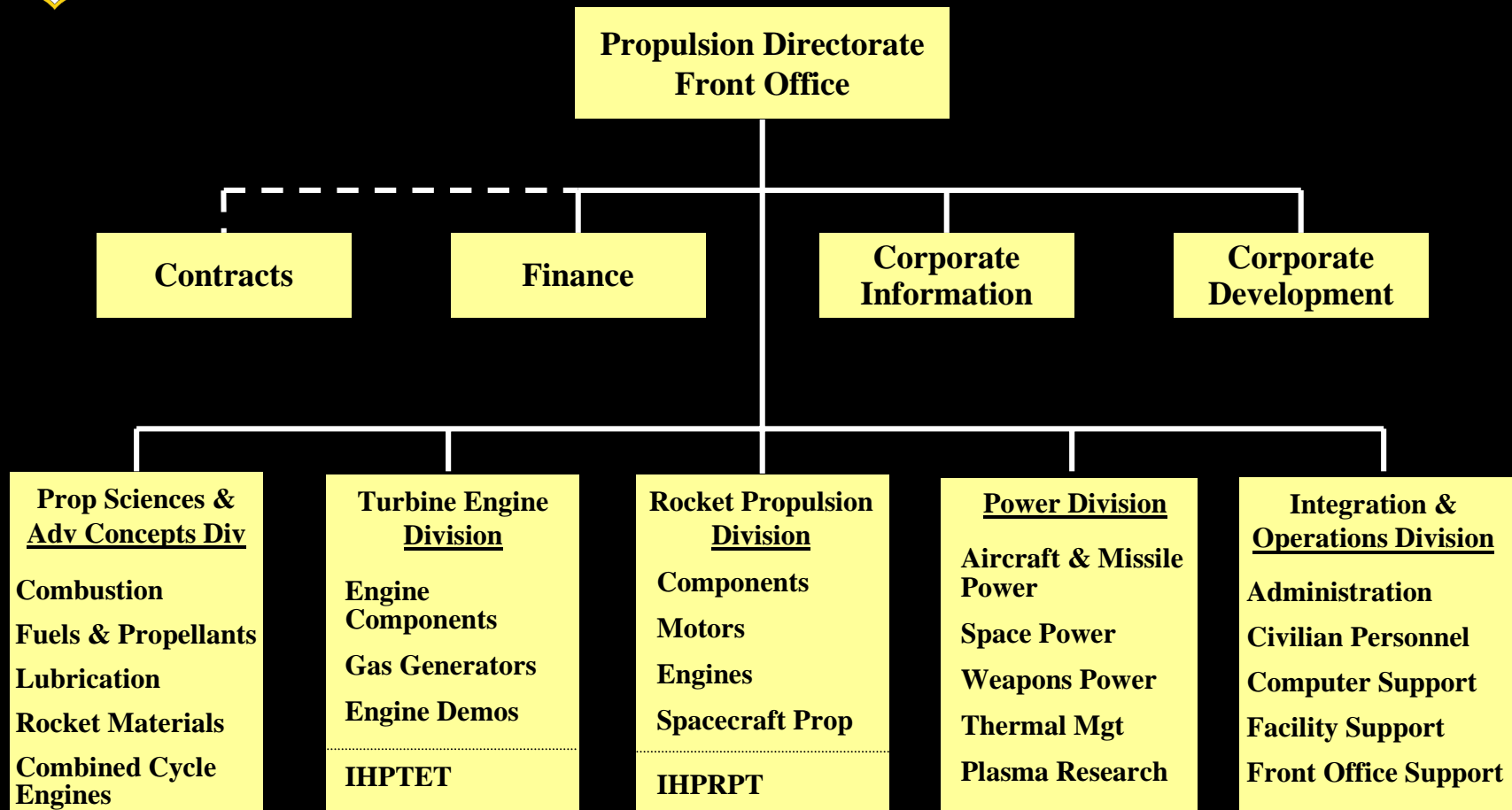
Solar Propulsion



Solid Propellant Research



Propulsion Directorate



Three Integrating Technology Thrusts

Advanced Propulsion and Power For:

AIR

- Aircraft Turbine Engines
- Fuels / Lubes / Combustion
- Aircraft Power
- UAV Propulsion & Power

SPACE

- High Performance Boost
- High Energy Upper Stages
- Highly Maneuverable Spacecraft
- Space Power
- Combined Cycles

WEAPONS

- Hypersonic Missiles
- Directed Energy Power
- ICBM
- Tactical





Propulsion Directorate

**Opportunities for
Innovative Collaboration**



OPPORTUNITIES FOR COLLABORATION

AFRL's Propulsion Directorate

Title

Pulse Power Technologies For Aerospace Applications

Description

- **Technical opportunities:**
 - **Pulse Power Modeling & Simulation**
 - **Hybrid Thermal Management**
 - **Pulse Forming Network technologies**
 - **Pulse Power Turbogenerators**
 - **Pulse Power Caps, Batteries, Switches**
 - **Pulse Power Space Systems**

Vision

- **Near term applications:**
 - **Flight weight pulse power systems for tactical aircraft directed energy weapons**
- **Longer term applications**
 - **Pulse power technologies for spacecraft propulsion, space based sensors and weapons**



OPPORTUNITIES FOR COLLABORATION

AFRL's Propulsion Directorate

Title

Pulsed Detonation Engines at PR east & west

Title

Description

- **Develop, maintain, and distribute air-breathing and rocket pulsed propulsion information:**
 - Performance data
 - Research and performance models
 - Analysis tools
 - Proprietary and classified information

Vision

- **Provide benchmark data**
- **Make R&D capability available to promote technology**
- **Develop and maintain in-house research competency**



OPPORTUNITIES FOR COLLABORATION

AFRL's Propulsion Directorate



Title

Advanced Solid Propellants for Tactical Missiles

Description

- **Enhance international program to develop advance tactical propellants**
 - **Higher energy**
 - **Low observables**

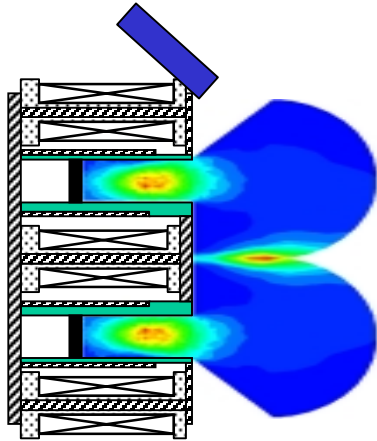
Vision

- **In cooperation with the worlds premier propellant chemists, develop the next generation tactical missile propellant.**



OPPORTUNITIES FOR COLLABORATION

AFRL's Propulsion Directorate



2D Hybrid-PIC Hall Code
Plasma Density Contours

Title

Hall Thruster Modeling to enable high-power testing in current AF ground facilities

Description

- **Develop better fluid models**
- **Develop better understanding of low-energy Xe sputtering yields & cross sections**
- **Expand effort in charge exchange physics**
- **Model sensor contamination**
- **Validate model by tests in ground facilities**

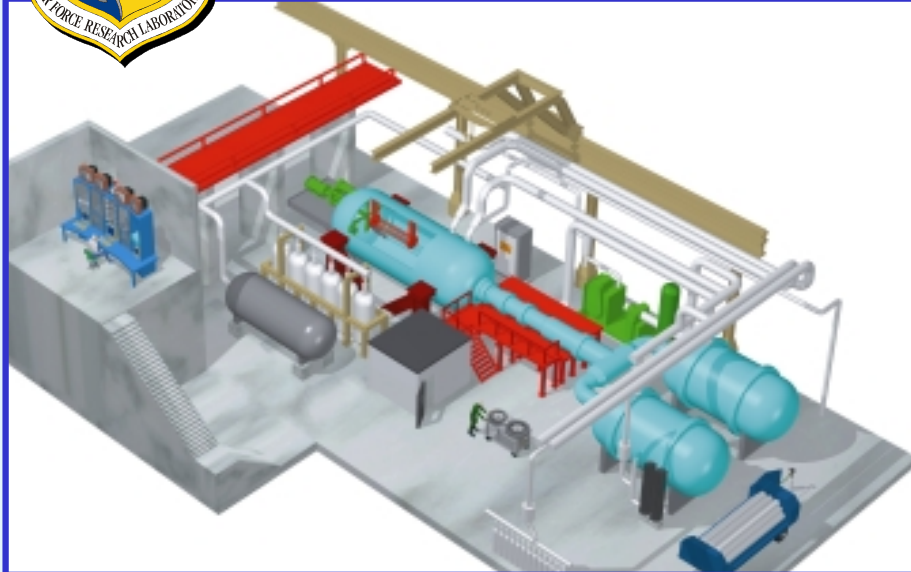
Vision

- **Validated model to correct high-power Hall thruster data perturbed by ground facility effects**
- **Save AF >\$20M in facility costs needed to perform IHPRPT phase III testing.**



OPPORTUNITIES FOR COLLABORATION

AFRL's Propulsion Directorate



Title

Advanced Turbine Aerodynamics and Heat Transfer

Description

- Host faculty, students, NRC's, post doc's, industry, small business
- Do research on better performance, durability by active and passive flow control, new diagnostics, studying combustor-turbine interactions
- More effort on math modeling to guide experiments in Turbine Research Facility

Vision

- Develop "Maintenance-Free" hot section
 - Turbine system lasting full engine life
- Raise performance & improve cooling
 - Smaller, lighter, higher loaded turbines

SUMMARY

Augmenting PR's workforce is important to quality
Air Force S&T

PR's front office is now reviewing *all* S&E
vacancies to see if they are best filled by

- NRC (National Research Council) fellows
- IPAs (Intergovernmental Personnel Agreements)
- Exchange S&Es
- Term and temporary S&Es
- Permanent S&Es

STW-21 collaboration searches for new mechanisms
that mutually benefit both parties