

REPORT DOCUMENTATION PAGE

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Prescribed by ANSI
Std. Z39.18

Aerospace Systems Technical Research Operation Services



Industry Day

8 July 2014

Contracting Presenter – Aimee Helm, AFTC/PZRB

Technical Presenter – Robert Shah, AFRL/RQRO

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Agenda



0800 – 0815	Meet and Greet Social
0815 – 0845	Edwards Research Site Overview
0845 – 0900	Identification of Key AF Personnel
0900 – 0915	Business Information
0915 – 0930	Break
0930 – 1000	Technical Information
1000 – 1030	Q&A
1030 – 1100	Tour 1/Individual Q&A Sessions
1100 – 1200	Lunch
1200 – 1230	Tour 2/Individual Q&A Sessions
1230 – 1500	Individual Q&A Sessions (as needed)

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Industry Day



- **Aerospace Systems Technical Research Operations Services (ASTROS)**
- **Vision: Obtain affordable and responsive buildup / modification of rocket test stands and facility operations for demonstrating next generation rocket propulsion technologies**
- **Early Industry Involvement**
 - Encourage competition
 - Feedback from industry



GOVERNMENT TEAM POC's



- **Procuring Contract Officer**
 - Judy A Gayler, judy.gayler@us.af.mil 661-277-7748
 - Aimee Helm, aimee.helm@us.af.mil 661-277-2101
- **Contract Specialists**
 - Joshua Vasquez, joshua.vasquez.5@us.af.mil 661-277-8213
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- **Acquisition Project Manager**
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- **Deputy Acquisition Project Manager**
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Air Force Research Laboratory Edwards Air Force Base, CA

Edwards Research Site Overview
for ASTROS Industry Day

Mr. Michael Huggins
Chief, Rocket Propulsion Division



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AFMC Mission Goals



Nuclear



Continue to Strengthen AFMC's Role in the Nuclear Enterprise



Technology



Advance Today's & Tomorrow's Combat Capabilities through Leading-Edge Technology



Life Cycle Management



Acquire and Support War-Winning Capabilities



Test & Evaluation



Perform World-Class Test and Evaluation



Sustainment



Sustain Air Force Capabilities through World-Class Depot Maintenance & Supply

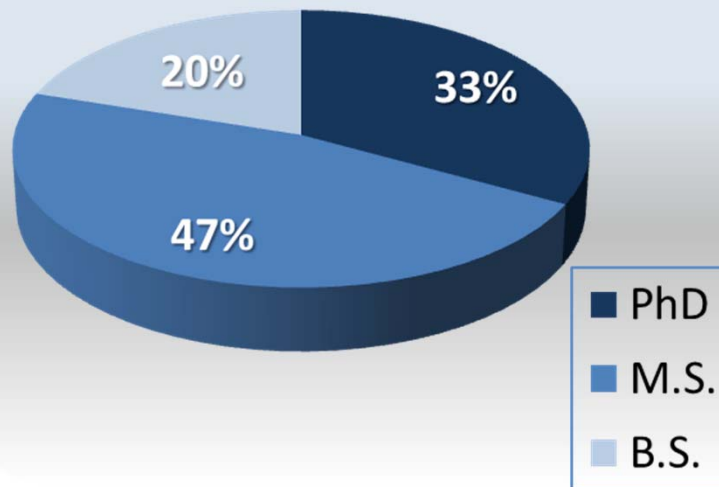


AF S&T Workforce (AFRL)



	Employees	Civilian *	Military	Contractor
Total	10,000	4,651	1,340	4,009
S&Es	6,179	2,774	746	2,659

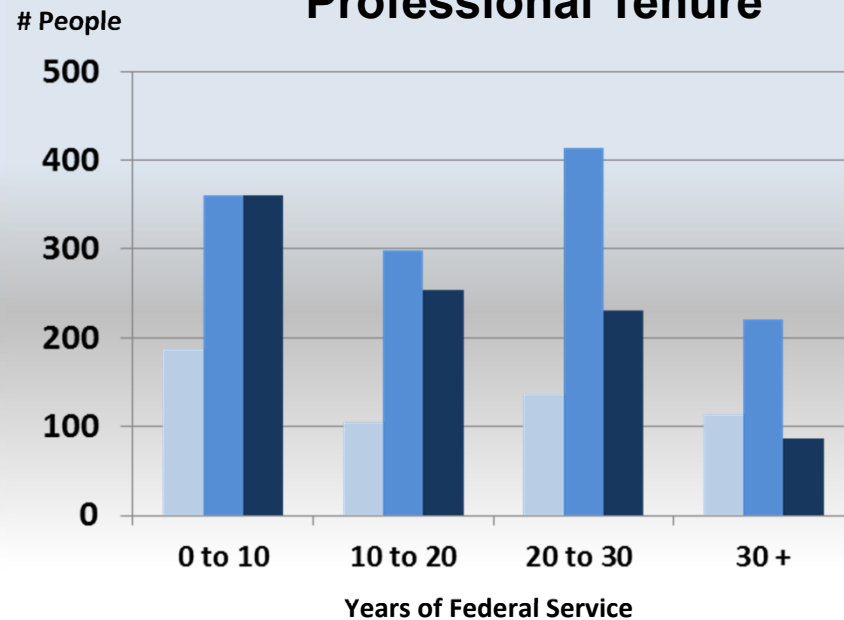
S&E Education



* Does not include Students

* Data as of: 31 August 2013

Professional Tenure





AFRL Technical Competencies



AF Office of Scientific Research

- Aerospace, Chemical & Material Sciences
- Education & Outreach
- Mathematics, Information, & life sciences
- Physics & Electronics



Aerospace Systems

- Air Vehicles
- Control, Power & Thermal Management
- High Speed Systems
- Space & Missile Propulsion
- Turbine Engines



Directed Energy

- Directed Energy & EO for Space Superiority
- High Power Electromagnetics
- Laser Systems
- Weapons Modeling and Simulation



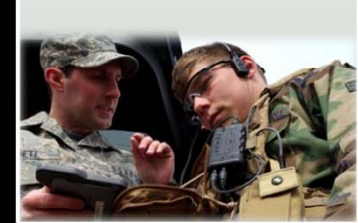
Information

- Autonomy, C2, & Decision Support
- Connectivity & Dissemination
- Cyber Science & Technology
- Processing & Exploitation



Human Performance

- Bio-effects
- Decision Making
- Human Centered ISR
- Training



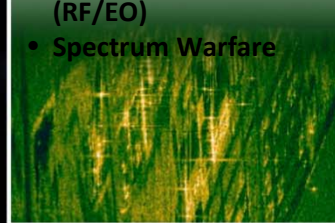
Munitions

- Fuze Technology
- Munitions AGN&C
- Munitions System Effects Science
- Ordnance Sciences
- Terminal Seeker Sciences



Sensors

- Advanced Devices & Components
- Layered Sensing Exploitation
- Multi-Int Sensing (RF/EO)
- Spectrum Warfare



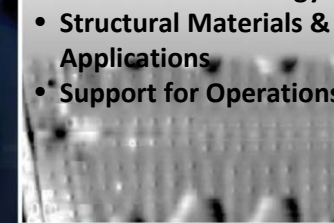
Space Vehicles

- Space Electronics
- Space Environmental Impacts & Mitigation
- Space OE/IR
- Space Experiments
- Platforms & Operations Technologies



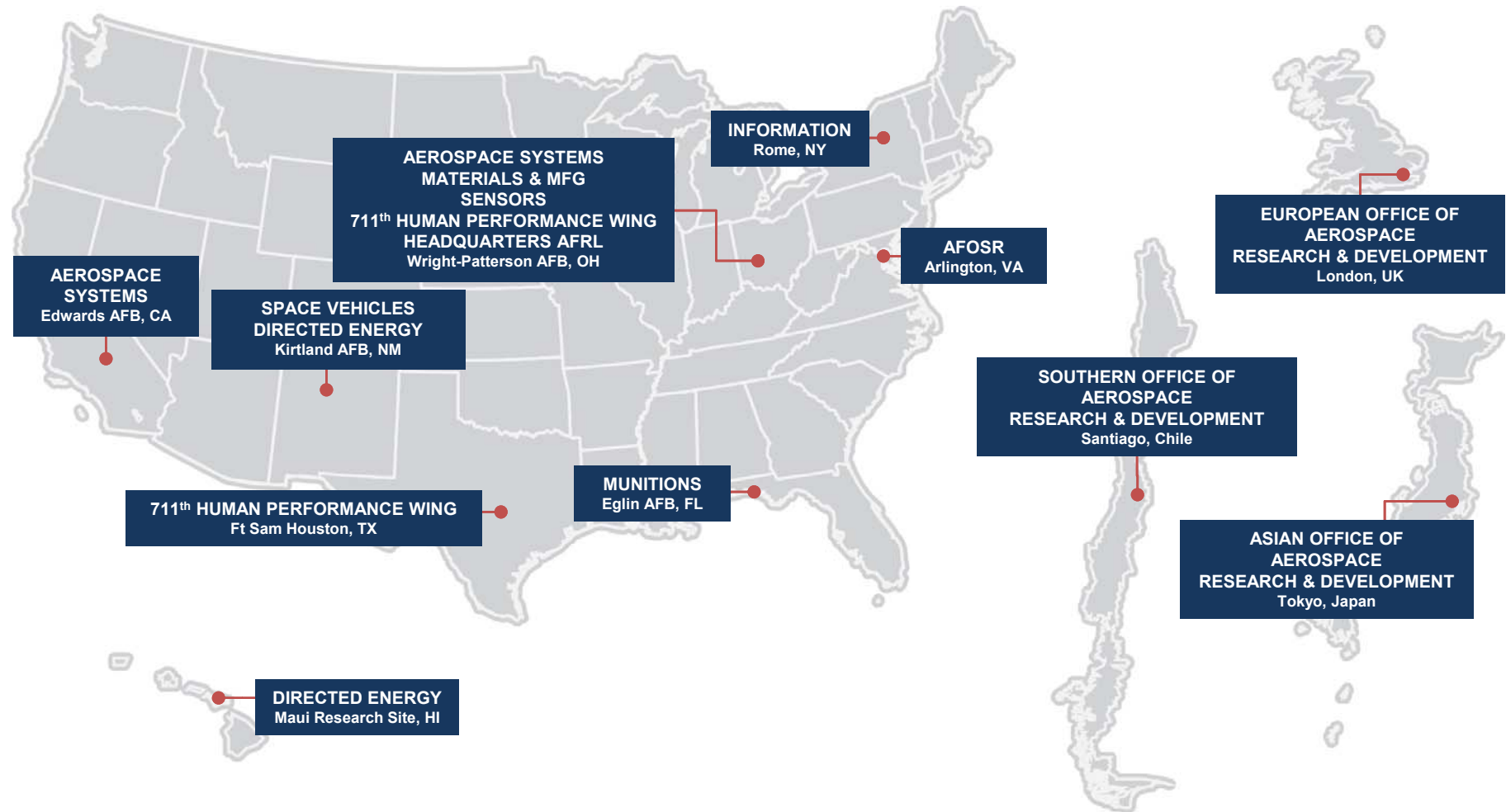
Materials and Manufacturing

- Functional Materials & Applications
- Manufacturing & Industrial Technology
- Structural Materials & Applications
- Support for Operations



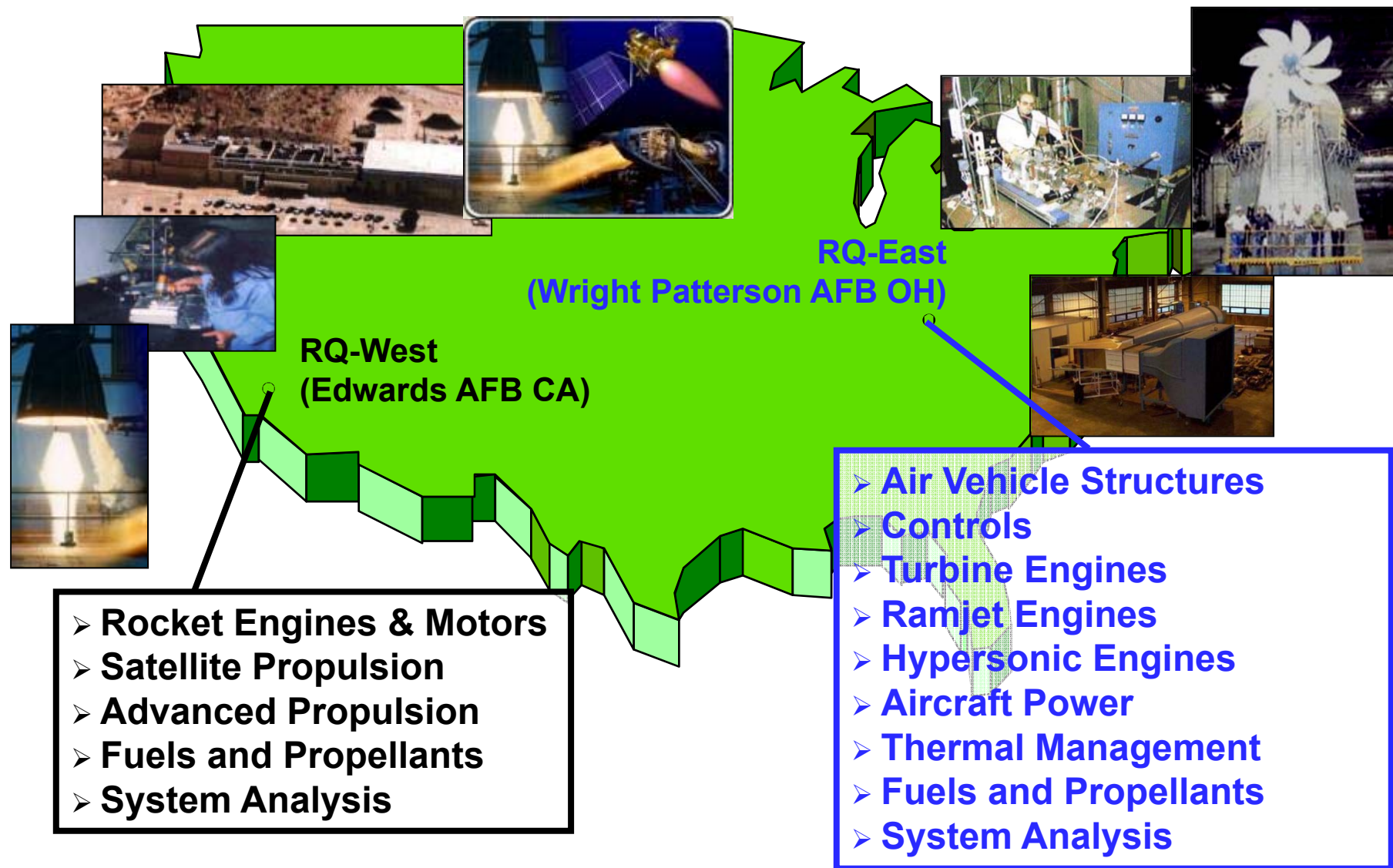


AFRL Locations



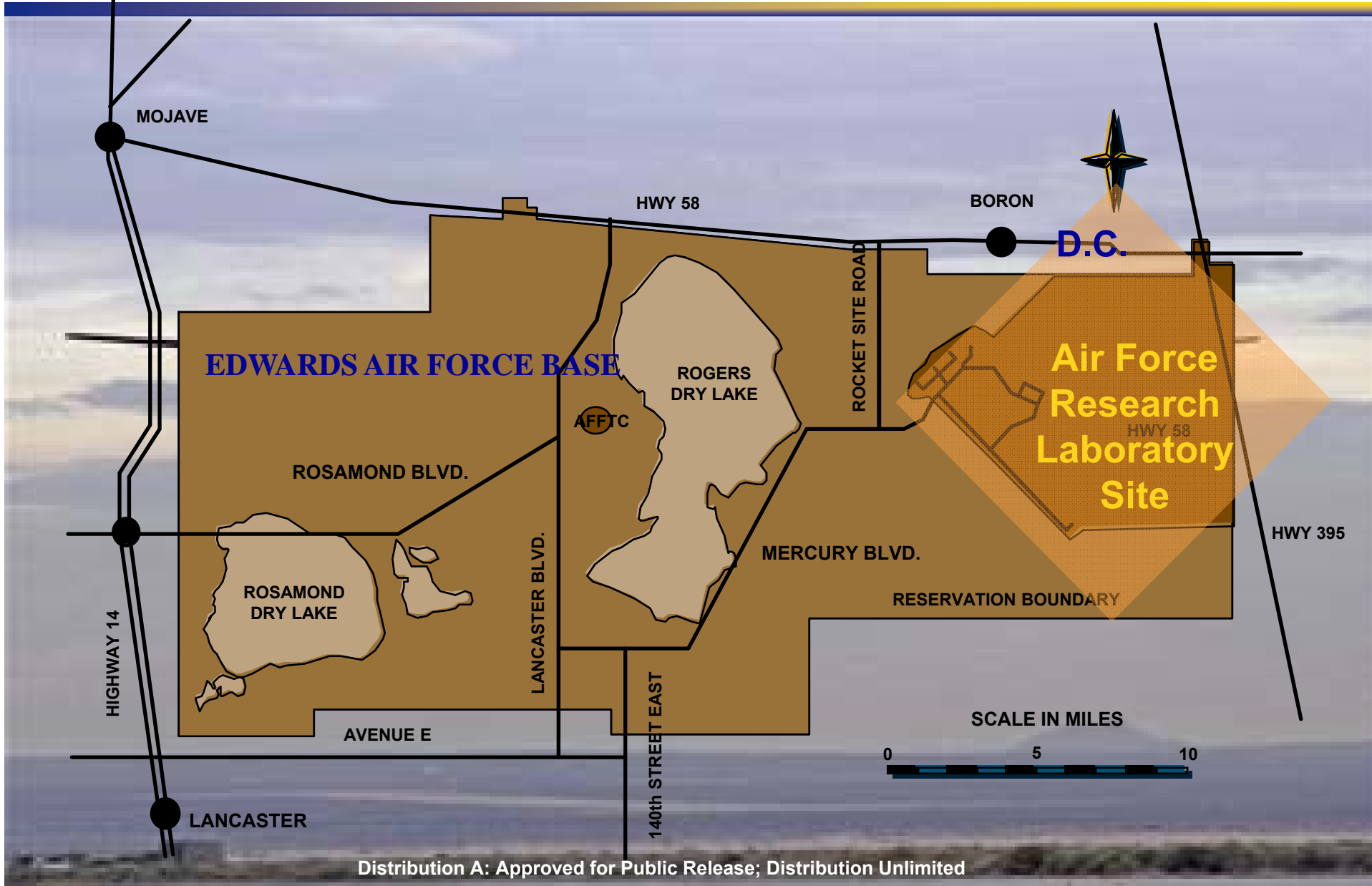


Where We Fit In





Edwards AFB

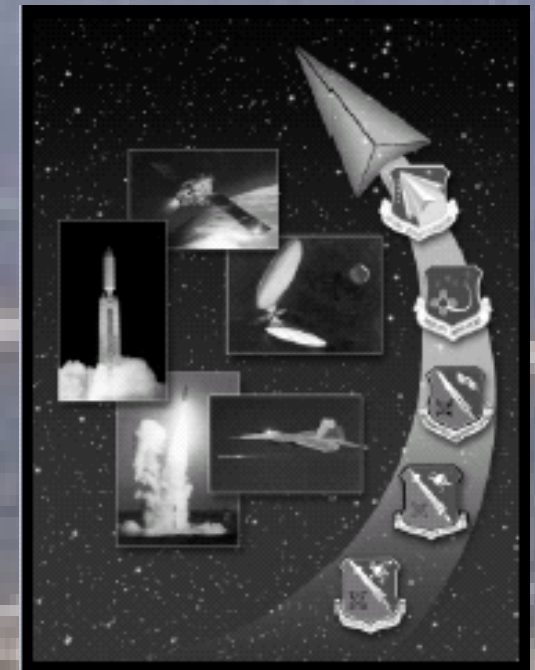




Edwards Site: Unique Capability



- **65 Square Mile Development Facility**
 - Air quality constraints do not inhibit research activities
 - Noise abatement not a problem
 - Wind/population corridor does not inhibit research
 - Environmental monitor/control systems in place
 - Flight Test Center relation/support ongoing
- **135 Major Lab/Engineering Facilities & Buildings**
- **30 Major Active Areas and Stands**
 - High Thrust Facilities
 - 19 Liquid Engine stands (up to 8M lbs thrust)
 - 13 Solid Rocket Motor pads (up to 10M lbs thrust)
 - Altitude Facilities (micro-newtons to 50K lbs thrust)
- **Unique geophysical set-up (\$2.5B+ investment)**





Facilities

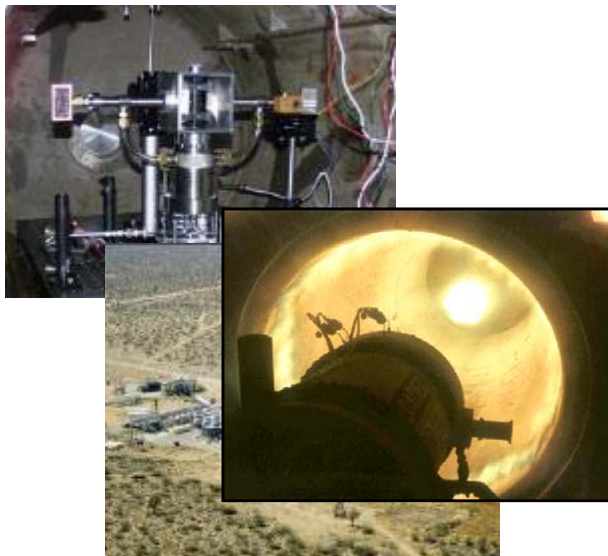


Bench-level Labs



Altitude Facilities

- From micro-newtons to 50,000 lbs thrust



High Thrust Facilities

- 19 Liquid Engine stands, up to 8,000,000 lbs thrust
- 13 Solid Rocket Motor pads, up to 10,000,000 lbs thrust





History of the Rock



- **AF Atlas ICBM/Launch Vehicle**
 - **Early 1960s on Test Stand 1-95**



Air Force photo

Atlas intercontinental ballistic missile

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History of the Rock



- Titan I & II ICBM
 - Test Stand 1-3 in Early 1960s
- Titan IV solid rocket booster
 - 1980s – 1990s in Area 1-32 and Test Stand 1-B



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History of the Rock



- F-1 engine testing for the Saturn V Rocket that put Men on the Moon



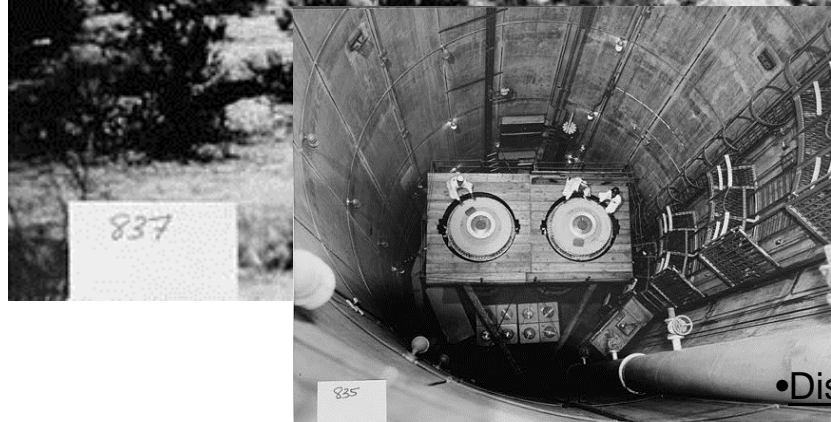
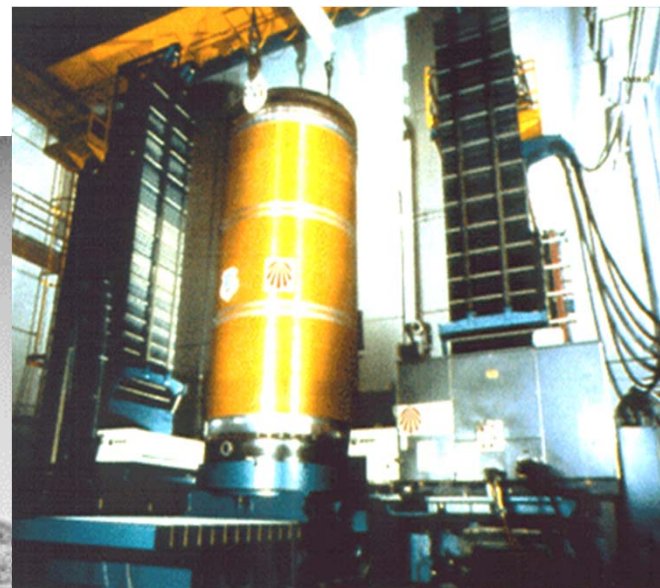
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History of the Rock



- AF Minuteman I, II and III ICBMs



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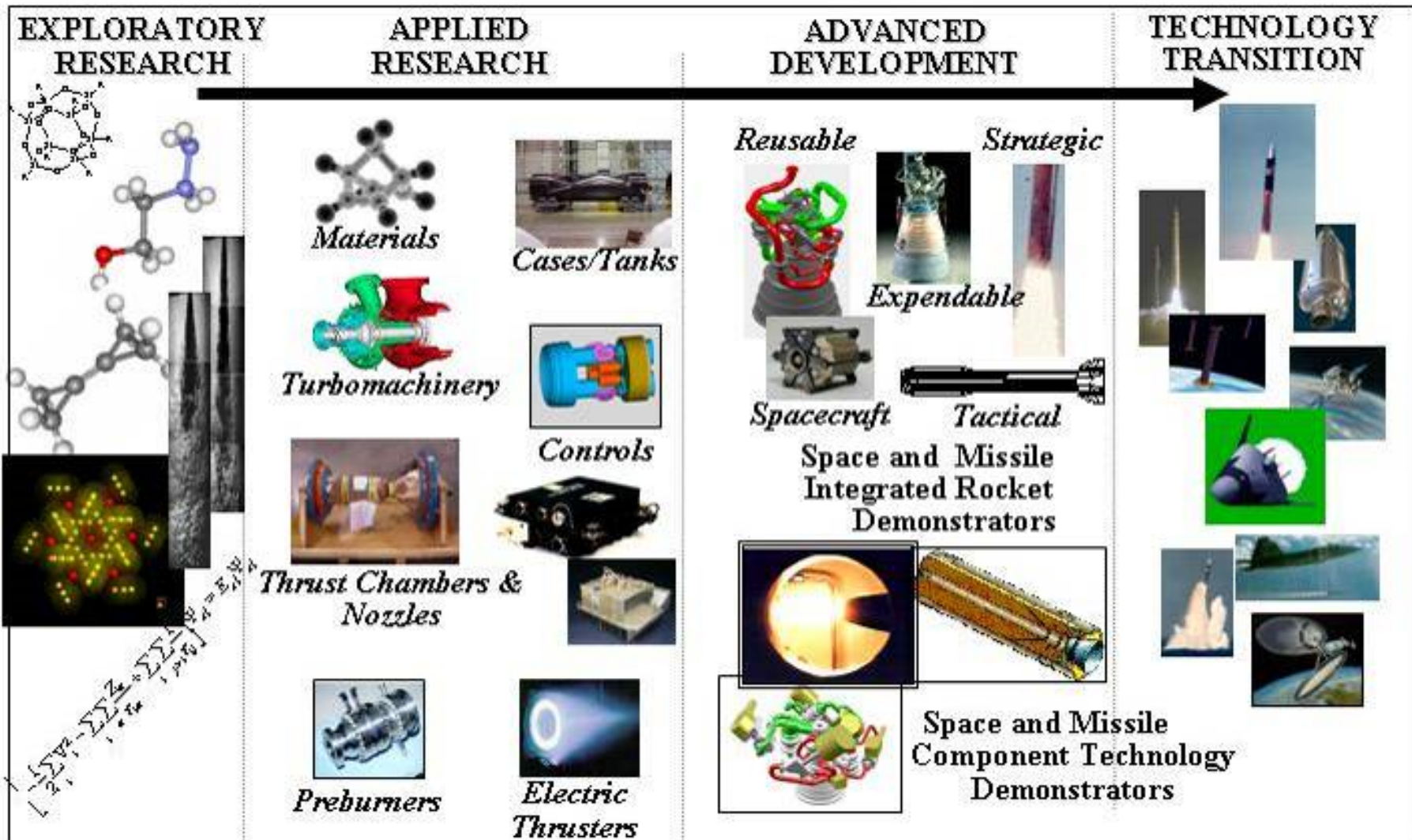
Space and Missile R&D Building Block Process



6.1

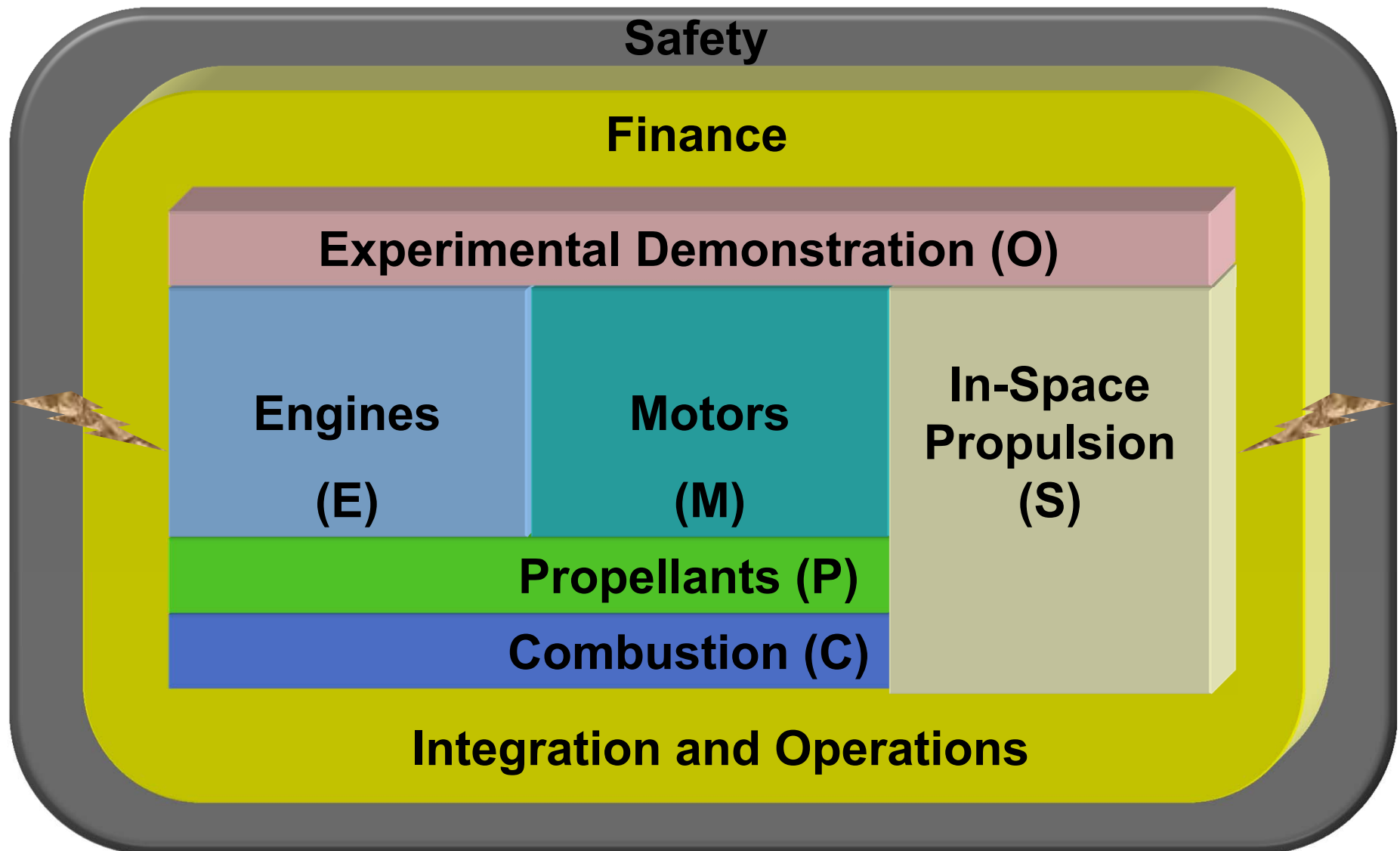
6.2

6.3





Rocket Propulsion Division (RQR) Functional Layout





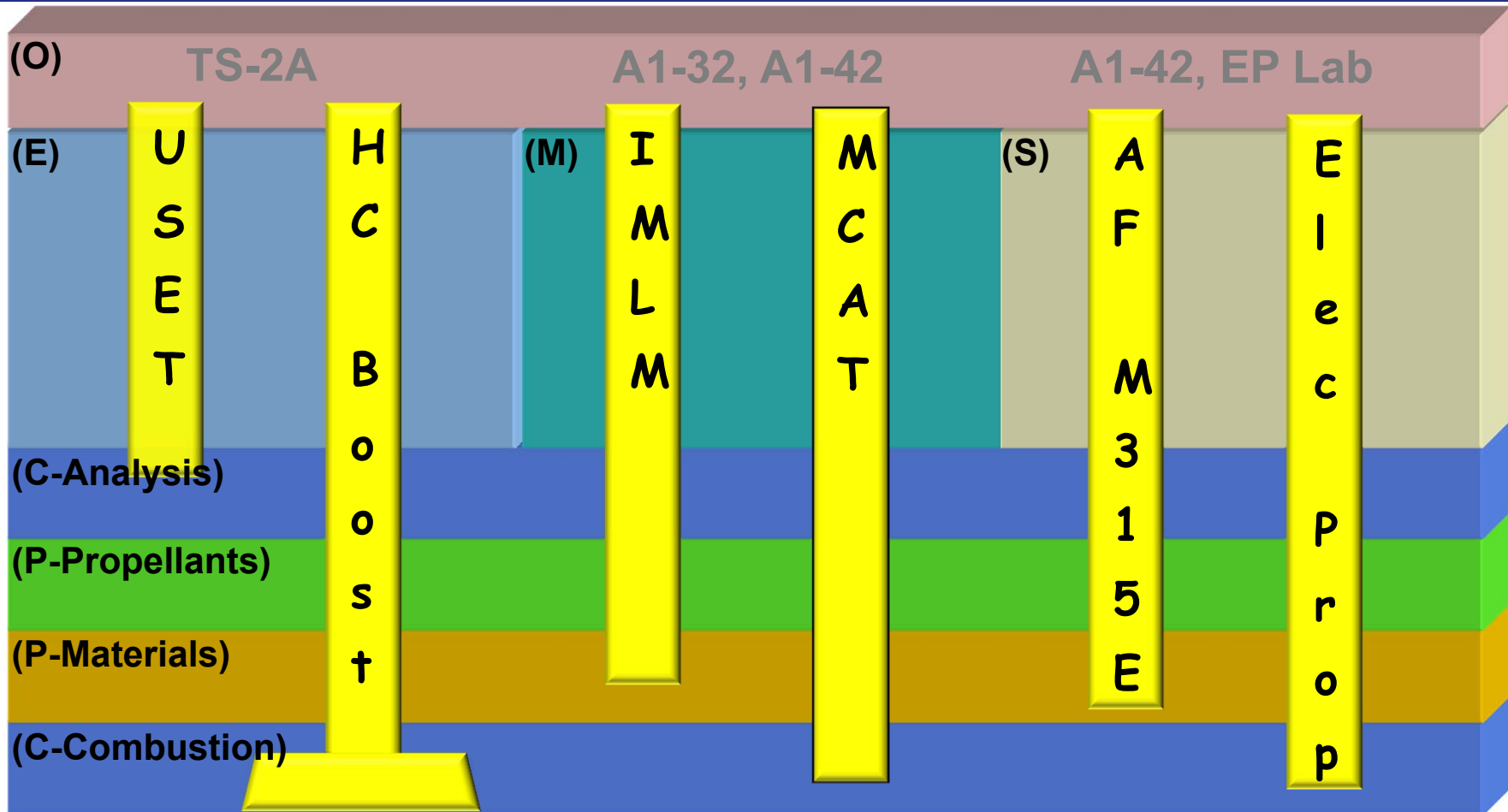
Branch Competencies/Expertise



- **RQRC – Combustion Devices**
 - Non-Equilibrium Flows, Fuel Stability, Heat Transfer, High Temperature Components, Propellant Fracture Mechanics, Analysis & Assessment
- **RQRP – Propellants**
 - Liquid &, Solid Rocket Propellant Modeling, Synthesis, Characterization, & Development, Polymers, Propellant Fracture Mechanics
- **RQRO – Experimental Demonstrations**
 - World-Class Facilities & Testing Support For Rocket Propulsion Technologies and Systems. Solids, Liquids, In-Space at Atmospheric or Hi-Altitude (including temp control)
- **RQRM – Motors**
 - Exploratory and Advanced Development of Solid Propulsion Technologies
- **RQRE – Engines**
 - Exploratory and Advanced Development of Liquid Rocket Engine Technologies
- **RQRS – In-Space Propulsion**
 - Exploratory and Advanced Development of Spacecraft Propulsion Technologies



Programs of Interest (it's all about the paradigm shifts)



USET – Upper Stage Engine Technology
IMLM – Integrated Motor Life Management
MCAT – Missile Component Advanced Tech

HC Boost – Hydrocarbon Boost
AFM 315E – Green Propellant
EP – Electric Propulsion

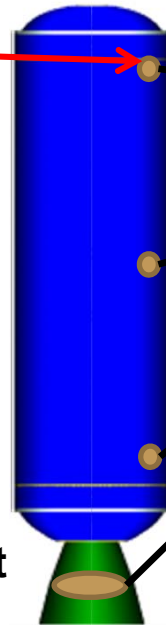


IMLM (Integrated Motor Life Management)



Goals: **Reduce predictive uncertainty of future state of a motor on an individual basis by 20%/50%** (near/far term goals)

Sensors
to include:
temperature,
humidity,
case
damage,
propellant
slump,
acceleration,
and TVA
displacement
and load



Initial state and
inspection data

Data
processing
and storage

Analysis

Command
& control

First
integration of
motor specific
sensor data to
advanced
aging models
to **provide a
individualized
service life
estimate**

In-House:

- Validation of A&S modeling capability
- AFNWC funded supported for ANDES improvement (Automated NDE Data Evaluation System)

The WOWs

- Potential to provide millions in cost avoidance
- Provide accurate, near-real-time motor health condition (diagnostics)
- **Provide individualized service life estimates (prognostics)**
- Transition opportunity ~ 2018

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MCAT (Motor Component Assessment Technology)



What are we doing? Developing new solid rocket motor (SRM) components and M&S tools that **decrease inert weight by 20%**.

Customer why? **High-speed penetrator weapons will enable attack of deeply-buried targets.**

Tech Reason? New M&S tools may show possibility of higher efficiencies from SRM designs.

Transition? 3 of 6 FY12 task orders support an AFRL FCC. 1 of 6 FY12 task orders supports AFNWC.



In-House:
Experiments to validate new models



The WOWs

- The AFNWC propellant task is part of a plan that may save \$2.1B in future acquisition costs.
- We are only gov't lab doing solid rocket motor R&D for launch & strategic needs.



USET (Upper Stage Engine Technology Program)



- Validating new suite of LOx/Hydrogen rocket engine M&S tools through heavily-instrumented 4,000 hp, 90,000 rpm turbopump
- Risk reduction work ups TRL of components allowing SMC/LR NGE program to enter post-milestone B, saving years on the schedule and \$multi-M's in cost
- Verify and Validate suite of tools to greatly reduce the amount of physical testing by conducting better M&S during design
- NGE with SMC/LR and tools used in current NGE risk reduction work, Hydrocarbon Boost, >45 M&S tool-specific transitions to industry, DOD, NASA



In-House:

- Test stand Buildup
 - Design of new facility hardware
 - Hardware Fabrication
 - Hardware Installation
- In-house tool validation and verification
- On-site rapid data reduction and analysis



The WOWs:

- SMC/LR requested TTP transition to NGE
- Key member of AUSEP (Affordable Upper Stage Engine Program) IPT
- Conducted Risk Reduction work on USET contract to support AUSEP TRL requirements
- Most highly instrumented, highest tip speed and suction of any turbopump ever tested



Program Completed, Report in Progress

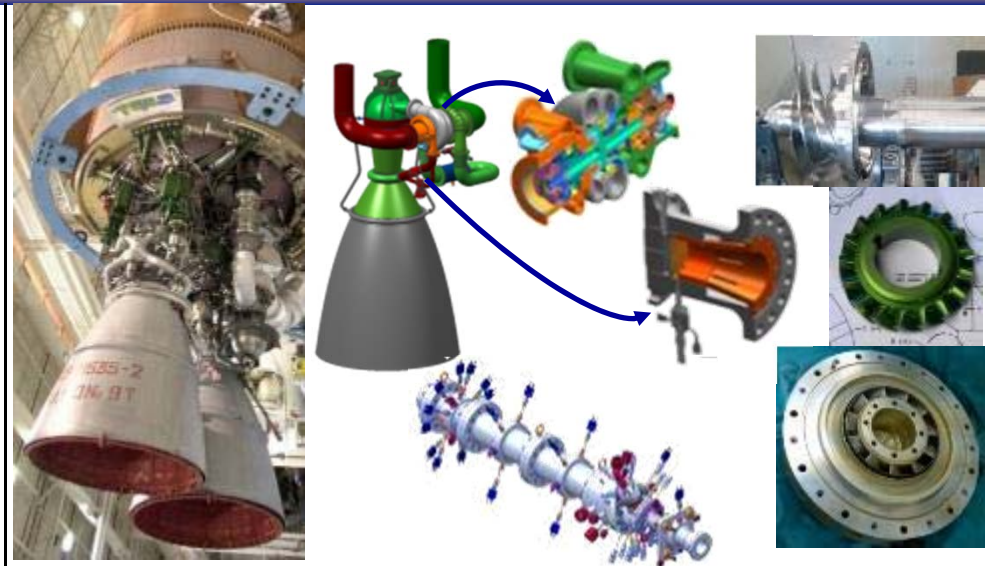
SMC/LR AUSEP
Vision Engine



HC Boost (Hydrocarbon Boost Program)

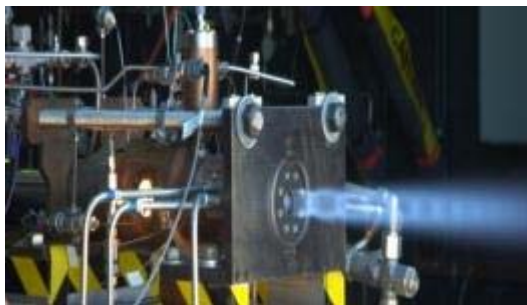


- HCB establishes advanced, modern, domestic LRE Tech Base
 - Required to replace Russian RD-180 on EELV
 - U.S.'s 1st reusable, high-perf HC engine
 - Establishes Ox-rich staged combustion (ORSC) tech base for U.S.
 - Sustain ailing U.S. rocket engine industry tech development base
 - HCB strongly supports SMC/LR American Kerosene Engine project



In-House:

- Building subscale test facility to mitigate combustion devices risk
- Critical combustion research using 219 funds
- Fuel thermal stability, nozzle cooling, injector design



The WOWs:

- Design, build, test ORSC LOx/Kerosene Liquid Rocket Engine Tech Demonstrator
 - 250K-lbf with high Throttle Capability (SOTA is 2:1) – Enables mission flexibility
 - 100 Life Cycle with 50 cycle overhaul (SOTA is 20) – Exceeds requirement, provides margin
- ORSC is a higher performing engine resulting in a smaller launch vehicle or an increase in delivered payload



Electric Propulsion



What are we doing? Developing new technologies that enable less expensive, more maneuverable and more agile s/c

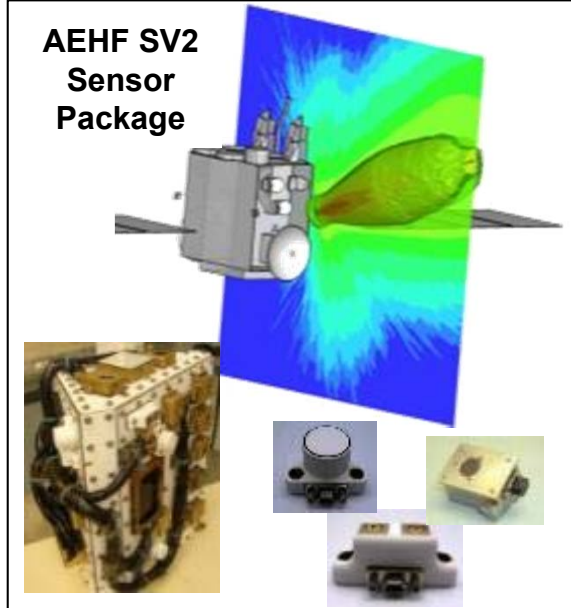
Customer Why? Reducing launch mass substantially reduces launch cost, increases payload fraction, and enables missions otherwise not possible (e.g. AEHF)

Tech Reason? **Plasma propulsion increases Isp by 10x, reducing s/c propellant 10x**, enabling lighter and/or more capable s/c

Transition? • Tech demos: FalconSat-5—demonstrating low power propulsion and spacecraft impact
• Operational systems: AEHF—enabling high mass spacecraft directly supporting warfighter



AEHF SV2 Sensor Package



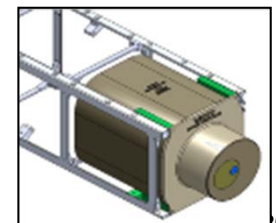
In-House:

- Test facilities
 - 8 vacuum chambers
 - Thruster design
 - Diagnostics
 - Validation of M&S
- Mod/Sim Program
 - Advanced numerical methods



The WOWs:

- **AEHF requested assistance with thruster performance verification; SV-2 onboard diagnostics package flying**
- Developed propulsion module for FalconSat-5 tech demo, including spacecraft interaction diagnostics
- **Cubesat EP propulsion module selected by 2 constellations for flight in 2014**
- National M&S effort for EP coordinated by AFRL-RZSS





AFRL Developed Advanced Monopropellants



What are we doing? *Providing advanced propellant with higher performance and much lower toxicity than hydrazine*

Customer why? *Faster operational response with reduced costs can be attained with greater mission capabilities*

Tech Reason? *Energetic ionic liquids provide low vapor toxicity and high energy density*

Transition? *Orbital flight experiment on TBD S/C-2014*



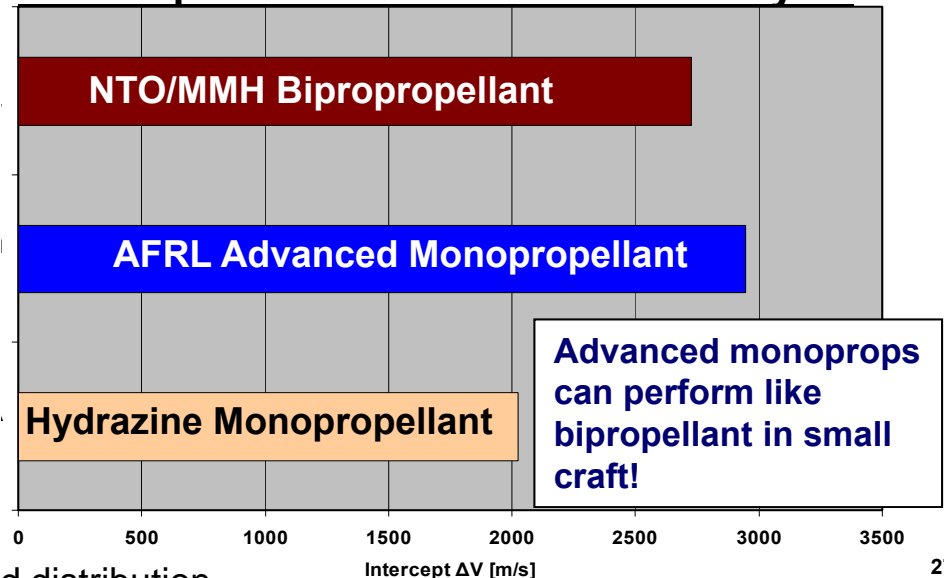
1N – 12N N₂H₄ Thrusters

In-House:

- Fully characterized small scale safety & hazard properties
 - Passes all safety requirements
 - DOT approval for transport
- First successful thruster firings
- Pilot scale propellant production
 - *Advanced monopropellant cost = hydrazine cost*
 - Supplying transition programs

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Small Spacecraft Benefits Trade Analysis



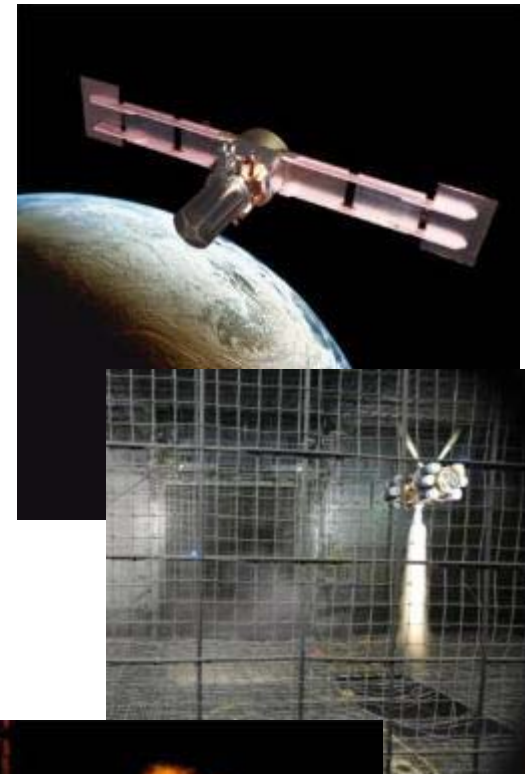


What Have We Done Lately?



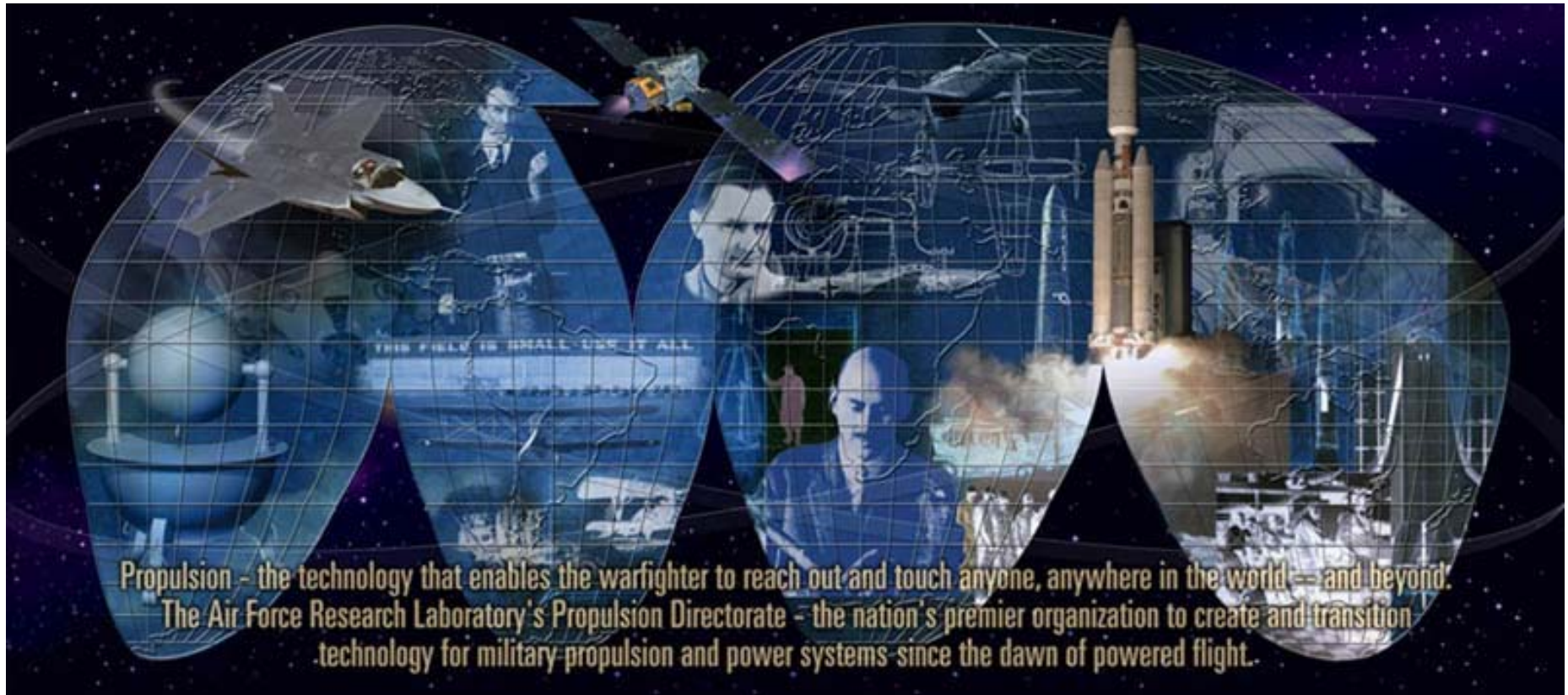
Recent Technical Achievements

- Transitioned 200W Hall Thruster to TacSat-2
- Delivered 8 CubeSat thrusters to NRO (10x inc in performance)
- USET demo (liquid rocket engine turbopump), M&S transitions & tech transition to customer
- Hydrocarbon Boost subscale preburner on test stand (testing to begin CY14)
- Combustion Stability Test Rig/Facility passed last hurdle, testing to begin this quarter (219 funded)
- New energetic ingredient (furazan class) cleared for large batch (10 lb) scale-up





Questions?





ASTROS



ASTROS Project Manager

Jamie Malak

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Contract History



- **Research Operation Support Services (ROSS I & II)**
 - **Combined three contracts**
 - **Operational Services Support (OSS)**
 - **Technical Services Support (TSS)**
 - **Facility Support Maintenance Services (FSMS)**
 - **15 year history**
 - **ROSS I, \$142M, PoP 1999 - 2011**
 - **ROSS II, \$118M, PoP 2011 - 2016**
 - **Competitive source selections**
 - **CPAF**



Meeting Objectives



- **Objectives of Industry Day**
 - Present proposed program
 - Goals
 - Schedule
 - Seek input for acquisition strategy
 - Provide details on Request For Proposals (RFP)
 - Gain concurrence/feedback from industry on this plan.
 - Send feedback to email addresses listed at www.fbo.gov
 - Q & A responses will be posted under FA9300-15-R-0001 in FBO NLT 27 July 2014



Business Overview



Contracting Presenter

Aimee Helm

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Contracting Overview



- **Current Contract**
- **Requirements to do Business with the Government**
- **Acquisition Background**
- **Contract Type**
- **Contract Structure**
- **Acquisition Conditions**
- **Oversights**
- **Deliverables**
- **Tentative Contracting Milestones**
- **Base Support/Government Furnished Services**
- **Organizational Conflict of Interest**
- **Source Selection**

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Current Contract



- **ROSS II, FA9300-11-C-0001**
- **Current Contractor: Jacobs Technology Inc.**
- **Contract Type: CPAF, FFP, CPFF**
- **Original Total Contract Value: \$86M**
- **Current Contract Value: \$118M**
- **NAICS Code: 541712 - Research and Development in the Physical, Engineering, and Life Sciences (Except Biotechnology)**
 - **SB size standard 1000 Employees**



Requirements to do Business with the Government



- **System for Award Management (SAM)** required in accordance with FAR 4.1102. Access at: <https://www.sam.gov/portal/SAM#1>
 - **Core Data (formerly Central Contractor Registration or “CCR”)**
 - **Representations & Certifications (formally Online Representations and Certifications or “ORCA”)**
- **Wide Area Work Flow(WAWF)**: Contractors will submit payment requests in accordance with the instructions contained in their specific contract. Reference DFARS 252.232-7003. Contact your particular DCMA office for training. Access at: <https://wawf.eb.mil/>



Acquisition Background



- **Project Name: ASTROS**
- **On Site Support – AFRL/RQ- West**
- **Anticipated Period of Performance, 10 years**
 - 4 Year Basic
 - 2 Year Award Term
 - 2 Year Award Term
 - 2 Year Award Term

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Tentative Contract Type



- **Cost-Plus-Fixed-Fee + Performance Incentive + Award Term**
 - CPFF (X%)+ PI (X%), request Industry input
 - **Possible Performance Incentive Criteria**
 - Management
 - Technical
 - Cost
 - Schedule



Anticipated Contract Structure



- **Basic contract CLIN structure**
 - **CLIN 0001** **Phase In (FFP)**
 - **CLIN 0002** **ASTROS Labor (CPFF + PI)**
 - **CLIN 0003** **Materials and Travel (Cost), government provided amount**
 - **CLIN 0004** **CDRLs (NSP)**

- **Award Term Periods CLIN structure**
 - **CLIN X002** **ASTROS Labor (CPFF + PI)**
 - **CLIN X003** **Materials and Travel (Cost), government provided amount**
 - **CLIN X004** **CDRLs (NSP)**



Acquisition Conditions



- Security classification
- Base support
- Computer security requirements
- No foreign participation
- International Traffic in Arms Regulations (ITAR)
 - Public Law 98-94 (Export Control)
- Organizational Conflict of Interest (OCI)
- Non Disclosure Agreements (NDA)
- Associate Contractor Agreements (ACA)
- Unlimited data rights
- Environmental and safety requirements
 - Hazardous materials



Potential Oversight



- **Monthly Management In-House Reviews**
- **Regular updates to Government Program Manager and Work Plan Manager**
- **Compliance with Service Summaries**
- **Performance Incentive Reviews – fee**
- **Award Term Board – added years**



Potential Deliverables



- **Work Plan, as required**
- **Monthly Funds and Man-Hour Expenditure Report**
- **Property Control Plan**
- **State Environmental Health and Safety Plan**
- **Subcontracting Plan**
- **Quality Control Plan**
- **Instrumentation Controls Software/Programming**

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Organizational Conflict of Interest



- **Per Policy Memo 10-C-15 (15 Oct 2010) directed at AFFARS 5352.209-9000:**
 - Prevents conflicting roles which may bias the contractor's judgment of objectivity, or to preclude the contractor from obtaining an unfair competitive advantage in concurrent or future acquisitions.
 - **Alt III** – May not use other company's proprietary information in any other way or purpose
 - **Alt VI** – Restrictions are binding to any subcontractors – prime must include in any subcontracts
 - Both Alts apply to this contract
- **Policy Memo 10-C-15 can be found at**
 - <http://ww3.safaq.hq.af.mil/shared/media/document/AFD-101018-008.pdf>



Tentative Contracting Milestone



- **RFP release** Apr 2015
- **Proposals due** Jun 2015
- **Proposal evaluation** Jun-Oct 2015
- **Contract Award** Dec 2015
- **Phase- In (60 days)** Jan 2016
- **Full Performance** 1 Apr 2016



Base Support



- **Office space, furniture, telephones, computers**
- **Emergency medical transport**
- **Security police support**
- **Firefighter support**
- **Site specific training (i.e. Desert Tortoise)**
- **Custodial Service**
- **Use of government fuel supply**



Tentative Source Selection



- **Award based on Best Value**
- **Evaluation factors**
 - **Factor 1: Mission Capability**
 - **Subfactor 1: Technical scenarios**
 - **Subfactor 2: Program management**
 - **Subfactor 3: Subcontract management**
 - **Subfactor 4: Personnel recruitment and retention plan**
 - **Factor 2: Past Performance**
 - **Factor 3: Cost/Price**
- **Factor 1 is most important. Factors 2 and 3 are equal in importance and of lesser importance than Factor 1.**
 - **Factor 1 >(Factor 2 = Factor 3)**

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Tentative Source Selection



- **Written & Electronic Proposals**
 - **Electronic spreadsheets must include formulas**
- **Oral Presentations**
 - **15 minutes company description/capabilities**
 - **45 minutes evaluated**
 - **Factor 1, subfactors 2, 3 and 4**



Technical Overview



Technical Presenter

Robert Shah

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Technical Overview



- **Current Demographics**
- **Major Work Vectors**
- **Contract Management**
- **Security / ITAR Restrictions**

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Current Technical Demographics



- **Total number: 95**
- **Skill Sets Include**
 - **Scientists / Engineers (38)**
 - **Technicians (57)**
 - **Mechanics**
 - **Instrumentation and Controls**
 - **Machinists**
 - **Welders**
 - **Electricians**



Major Vectors



- **Provide comprehensive program management responsible for overall program coordination and all individual tasks required to satisfy assigned mission on time and at or under agreed budget**
- **Provide appropriate specialized skills related to rocket propulsion systems. Demonstrate flexibility to quickly respond to changing test stand build up requirements and priorities**
- **Provide robust, timely and accurate standardized electronic billing and purchasing systems at the CLIN/ACRN/Task level, linking PO & invoice (with % Davis Bacon Act)**
- **Maintain required safety, security, quality, code/regulation/logistics compliance and sustainability levels**
- **Maintain required configuration management such as drawings, SOPs, etc.**



Security



- **Work site is in an access controlled area**
 - Badges required
 - Military base requirements
 - Special requirements for visitor access
- **Some classified information may be generated**
- **No POVs in test areas**
- **Comply with International Traffic in Arms Regulations (ITAR) and EAR (Export Administration Regulations) as such items are generated**



Security (cont.)



- **All documents must be reviewed and approved by the Scientific and Technical Information Office (STINFO) prior to release. A vast majority of documentation generated will have limited distribution**
- **Contractors have a responsibility to inform their subcontractors and commercial suppliers that they must also comply**
- **For further information, please reference:**
 - **ITAR, 22 CFR 120-130,**
http://www.pmddtc.state.gov/regulations_laws/itar.html
 - **EAR, 15 CFR 730-774,**
http://www.access.gpo.gov/bis/ear/ear_data.html

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Questions & Discussion

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Agenda



0800 – 0815	Meet and Greet Social
0815 – 0845	Edwards Research Site Overview
0845 – 0900	Identification of Key AF Personnel
0900 – 0915	Business Information
0915 – 0930	Break
0930 – 1000	Technical Information
1000 – 1030	Q&A
1030 – 1100	Tour 1/Individual Q&A Sessions
1100 – 1200	Lunch
1200 – 1230	Tour 2/Individual Q&A Sessions
1230 – 1500	Individual Q&A Sessions (as needed)

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