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University Consortium for Applied Hypersonics

Project Solicitations

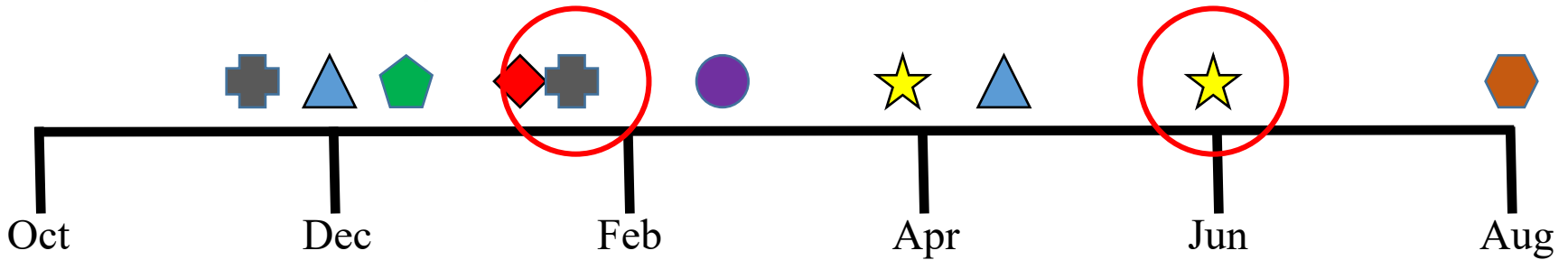
This Briefing is UNCLASSIFIED








Dan E Marren
Support Contractor, OUSD TRMC & JHTO
2 Dec, 2020

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Project Timeline



	Project Call Release Date	November 17, 2020//Jan 15 2021
	RWP/RPP Questions Cutoff	December 2, 2020
	White Paper Submission Deadline	December 14, 2020
	Notification of White Paper Evaluations	January 18, 2021
	Prototype Proposal Submission Deadline	February 22, 2021
	Award Notifications	March 29, 2021//Jun 4, 2021
	Projected Project Start Date	August 1, 2021



Submission Considerations



- Lead: Consortium Members
 - U.S. colleges/universities
 - 3 submissions/university across all topic areas
- All participants must be US citizens by project award
 - Case-by-case exceptions for UK, CAN, AUS, NZ
- Partnering encouraged
 - Other universities, UARCs, FFRDC, National Labs, Industry
- Cost sharing:
 - Not likely an issue
- Export Control/Distribution C Restrictions
- Pre-publication review



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UCAH Applied Research Technical Focus Areas

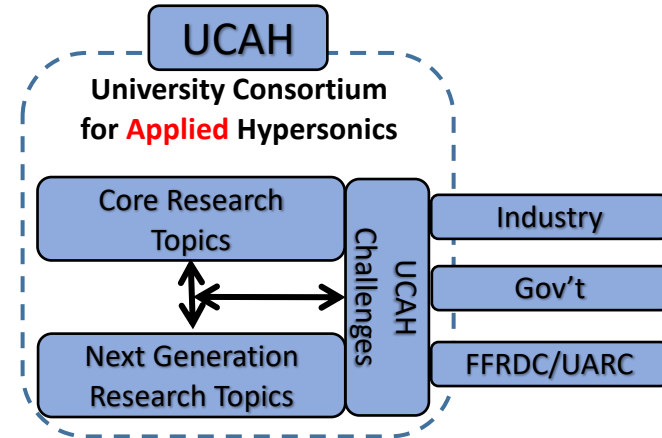
- **Materials, Structures, and Thermal Protection Systems**
- **Guidance, Navigation, and Control**
- **Air-Breathing Propulsion**
- **Hypersonic Environments and Phenomenology**
- **Applied Aerodynamics and Hypersonic Systems**
- **Lethality and Energetics**

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S&T Research Structure

- **An integrated plan to bridge the gaps between research categories and transition ready technologies**
 - **Core Projects** supporting the 6 technology focus areas
 - Up to three (3) years. (\$500K/year max)
 - “farmed” from the National Research Portfolios and JHTO S&T Road Map / IPT’s
 - **Next Generation Projects** to advance innovative ideas and transition the best ideas funded as basic research.
 - Up to three (3) years. (\$500K/year max)
 - **UCAH Challenge Projects** Teams of universities, with a transition partner, compete to solve a challenging multiple year/multi-disciplinary problem.
 - Guided by Grand Challenge ideas, release after Industry Day



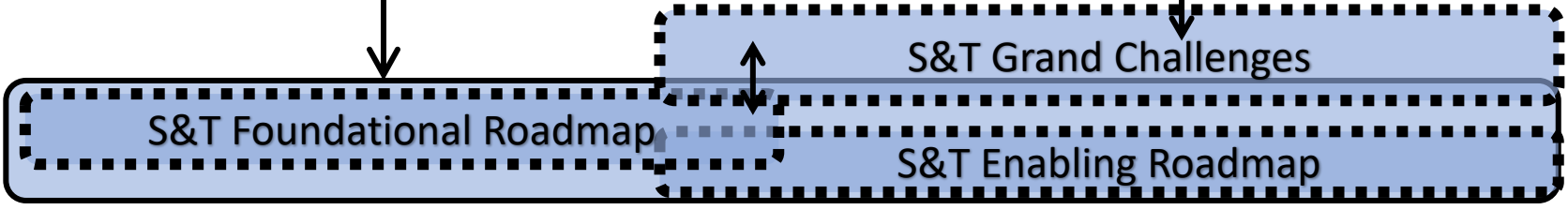
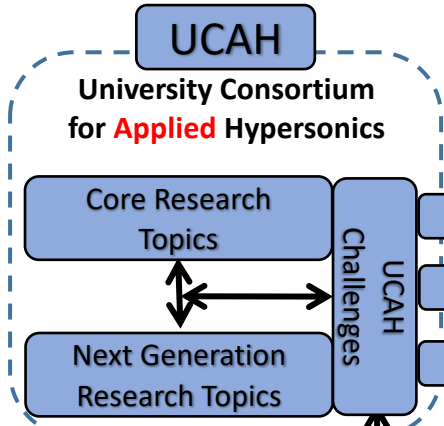
JHTO Plans to invest approx. \$20M in FY21 for Consortium management and projects



DoD Hypersonic Strategy and the UCAH

Hypersonic Strategy
Owner: OUSD(RE) / AD(H)

S&T Strategy
Owner: OUSD(RE) / Dir, JHTO



National 6.1, 6.2 Science Portfolios

National 6.2+ Research Portfolios

Air Force

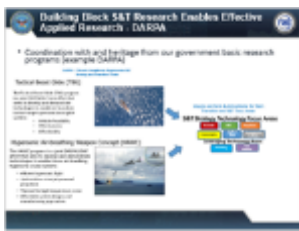
Navy

Army

NASA

MDA

DARPA



National Strategies Drive Projects; Basic Research Enables Them!



JHTO-Identified Applied Research Topics



- **Over 3-dozen Topics Drafted**
- **8, 1-year BAA's released in June 2020**
 1. Design swap for improved interlaminar shear and survivability
 2. Interferometric vision and optomechanical accelerometer sensing for NGC, and adaptive control
 3. Physics-Based Design Tool for Dual-mode Scramjet Isolators
 4. Simulation methods for the rapid prediction of hypersonic environments
 5. Investigations of self-starting stream-traced inlets at off-design conditions
 6. Modeling of high-speed multiphase blast effects
 7. Multiscale Modeling and Experiments to Understand Liquid-fueled RDRE's
 8. Curricula Development for a Robust Hypersonic Workforce
- **17, 3-year solicitations released in Nov 2020**
 1. Non-Destructive Testing for Hypersonics Materials Manufacturing
 2. Joining and sealing technologies for hypersonic vehicle materials
 3. Development of Coupled Machine Learning and Topology Optimization
 4. Seeker and sensor development for hypersonic vehicles
 5. Additively Manufactured Components for Hypersonic Vehicles
 6. Control Methodology for Changing Aerodynamic Structures
 7. High Accuracy Hypersonic Trajectory Prediction
 8. Damage Mitigation and Evolution in Blast Explosive Formulations
 9. Robust Feedback Control of Coupled Inlet Operability
 10. Directed Energy Radiation Interaction with Hypersonic Airflow
 11. Improved Methods for Development of Aerodynamic Databases
 12. Characterization, Modeling, and Validation of DACS Control
 13. Thermal Energy Harvest and Management
 14. Modeling, Simulation, and Testing of Separation Events
 15. Widening Flammability Limits of Solid Fuel for A/B Applications
 16. Multi-Disciplinary Optimization
 17. Next Generation Disruption Technologies
- **Challenge projects and additional research will be released in early 2021**



Grand Challenges

- Enterprise-level Grand Challenges will be created to involve Industry, Manufacturing, RDT&E and others.
- Challenges must represent important physics required for success of future hypersonic programs.
- Multi-disciplinary, multi-organizational challenges require significant partnering and use of infrastructure/tools;
 - **Scalability of Systems and Components** - Scaling for improved features and mission effectiveness
 - **Intelligent Systems** - Making systems aware, intelligent, independent, and capable
 - **Robust Operation** - Making systems function anytime anywhere in any environment
 - **Agile and Efficient Development** - Making systems work without several design cycles... Improving Evaluation
- Challenge campaigns act as a draw for self-interested organizations to come together around areas of common interest with National Impact.

DRAFT Under Construction



Example: Agile & Efficient Development

Several Potential Solicitations in Three Challenge Areas



- *Alternative Multidisciplinary Design Methods; Challenge consortium to develop a notional airbreathing vehicle utilizing alternative suites of tools (multi-physics, coupled optimization).*
- *Low-Cost Research Flight Testing Capabilities; Develop and field capabilities within academia to conduct small-scale component and scientific research testing for rapid prototyping and evaluation*
- *New Paradigm for Materials Development; Enact fundamental changes to methods for developing/screening/testing/fabricating high-temperature materials for TPS and seals, using physics-based modeling, diagnostics, and AI in design/optimization*

DRAFT Under Construction



LINKAGE of Research to Grand Challenges

(Example: Agile & Efficient Development)

- Grand Challenges focus Research on applications targeted at 7-20 years out

Grand Challenge

Agile and Efficient Development
Revolutionizing the process by which we conceptualize, design, evaluate, build, and field optimized and robust hypersonic systems.

- Grand Challenges can be broken down into achievable Multi-disciplinary UCAH Challenges

Potential UCAH Challenge Projects

Alternative Multidisciplinary Design Methods

New Paradigm for Materials Development & Manufacture

- UCAH Challenges give focus to Applied Core Research



S&T Technology Focus Areas

Core and Next Gen Projects

Simulation methods for the rapid prediction of hypersonic environments

Multi-Disciplinary Optimization

High Accuracy Hypersonic Trajectory Prediction

Improved Methods for Development of Aerodynamic Databases

Development of Coupled Machine Learning and Topology Optimization

Non-Destructive Testing for Hypersonics Materials Manufacturing

Joining and sealing technologies for hypersonic vehicle materials

Additively Manufactured Components for Hypersonic Vehicles

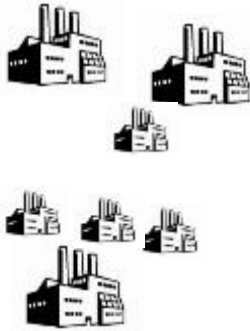


Challenges Linked to Enterprise

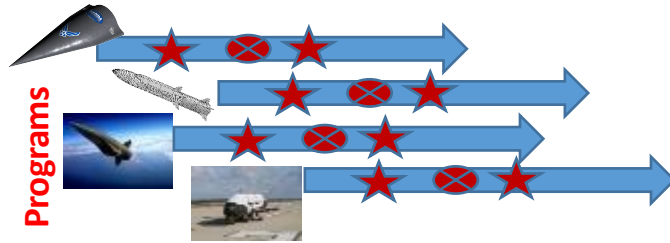
Government and
Gov't Affiliated
Service Agency
FFRDC/UARC

Science & Education

Universities



Acquisition

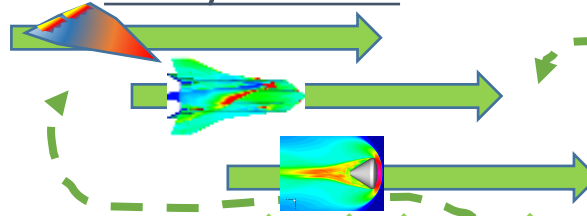


Programs



S&T / RDT&E

Challenges



Experiments

S&T Core Projects



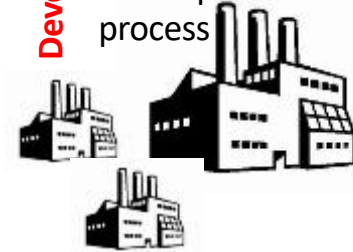
Next Gen Projects



Industrial Base

Developers

Industry can test methods and development process



Manufacturers

Manufacturers can validate process and products against relevant requirements





Summary

- **UCAH Applied Research Topics** – A product of detailed capabilities planning
 - Focus on cross-disciplinary/cross organizational engagement, applied research, technology transition, workforce development
 - JHTO Plans to invest approx. \$20M in the UCAH during in FY21
- **Prototype Projects are Advertised**
 - Core Projects supporting the six technology areas
 - Next-Gen Projects to advance innovative ideas, transition the best
 - Challenge Projects for complex multi-disciplinary problems
 - Teaming required between universities and a government or industry transition partner
- **Grand Challenges** - were developed to set context for applied research and maximize transition.



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University Consortium for Applied Hypersonics (U-CAH)



In a desert of dwindling skills, the UCAH stands ready to reinvigorate the Hypersonic Workforce and transition promising technology to the Warfighter

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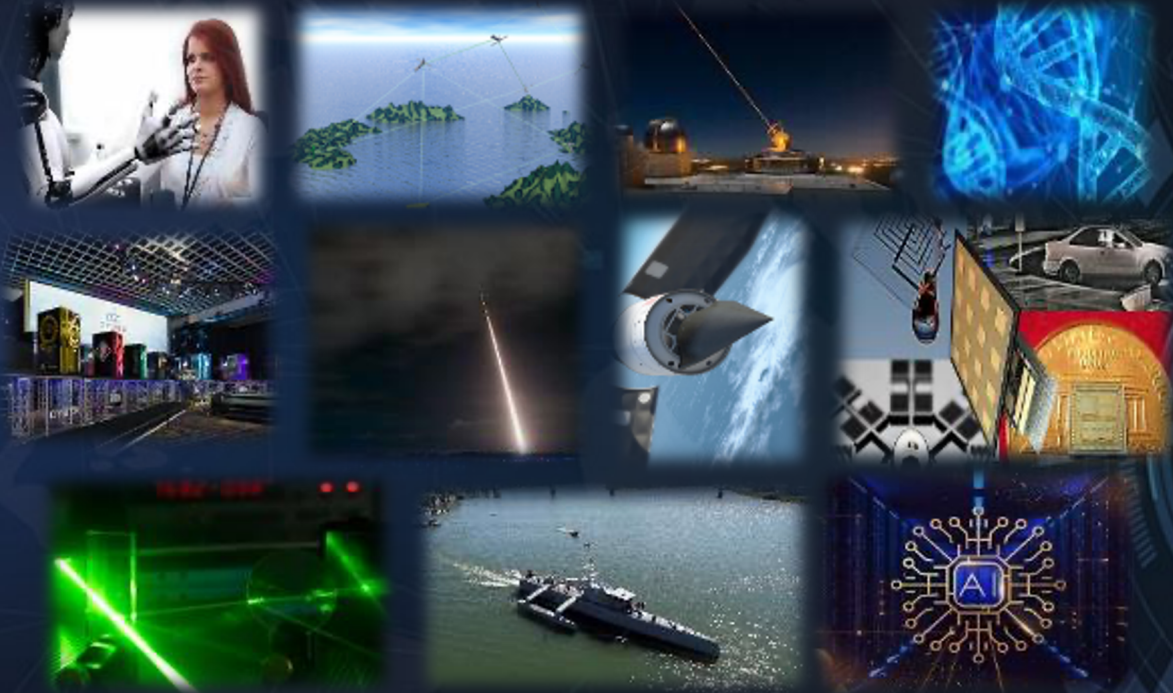


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DoD Research and Engineering Enterprise

Creating the Technologies of the Future Fight



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