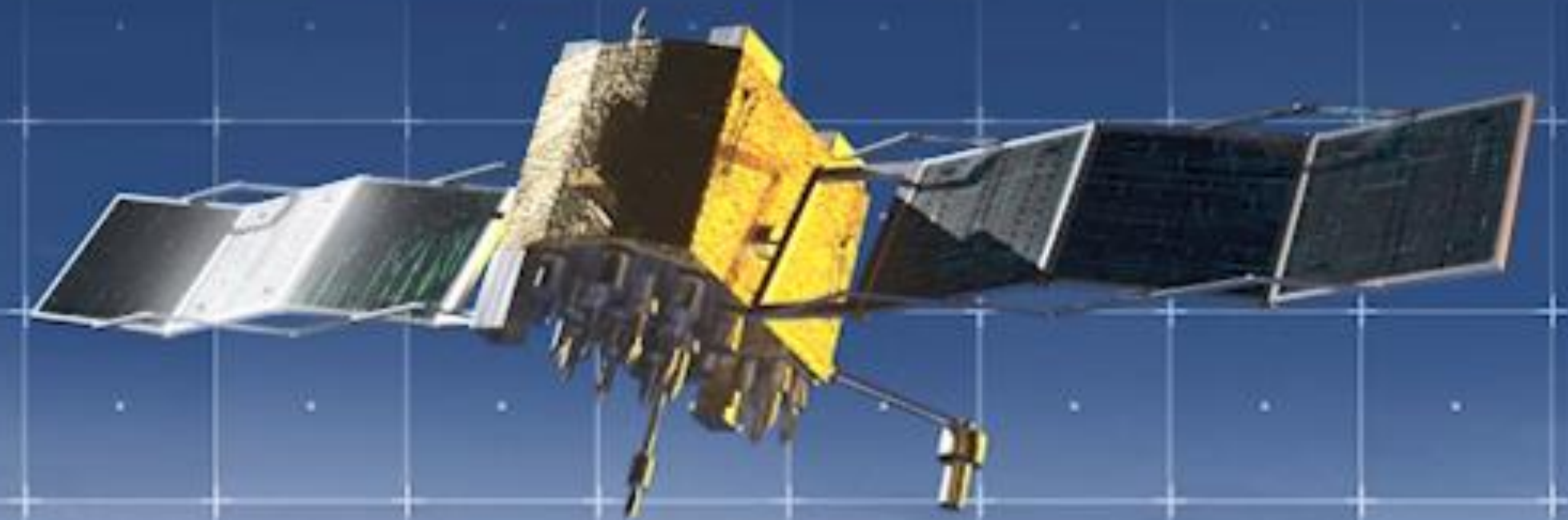


# AFRL

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## TECHNOLOGY FOR THE FUTURE FIGHT FOCUSING S&T ON OPERATIONAL NEEDS

NDIA 2022 ANNUAL SCIENCE & ENGINEERING TECHNOLOGY CONFERENCE  
26 APRIL 2022



JOHN MILLER, SES  
AFRL/XP





# INTRODUCTION TO THE AIR FORCE RESEARCH LAB (AFRL)



[READ MORE @  
AFRESEARCHLAB.COM](https://www.afresearchlab.com)

# WHAT AFRL IS ALL ABOUT



[READ MORE @  
AFRESEARCHLAB.COM](https://afresearchlab.com)

**VISION:** We defend America by unleashing the power of innovative air and space technology.

**MISSION:** Leading the discovery, development, and integration of affordable warfighting technologies for our air, space, and cyberspace forces.

A collage of images representing different areas of AFRL research and development. It includes scientists in a lab, a 3D model of a hypersonic missile, a person in a VR headset, a satellite, a jet ski, a soldier, and a robotic leg.

**SCIENCE**

**TECHNOLOGY**

**PROTOTYPING & EXPERIMENTATION**

**WARFIGHTER CAPABILITY**

*S&T ... Enhanced capabilities ... Higher mission success rates ... Airmen and Guardians return home safely*

# COMMANDER'S INTENT & PRIORITIES

**1 ACCELERATE S&T**

**2**  **ONE AFRL**   
**TWO SERVICES** **USSF**

**3 LEAD THE BEST**  
**AIR FORCE RESEARCH LAB**  
**TEAM**



# TECHNOLOGY EXAMPLES FROM AFRL AND ITS PREDECESSORS



**FREE-FALL  
PARACHUTE**

**EJECTION SEAT**

**TURBINE ENGINES**

**GUIDED MUNITIONS**

**ADVANCED THREAT  
ALERT SYSTEM**

**HYDROCARBON  
SCRAMJETS**

1920

1930

1940

1950

1960

1970

1980

1990

2000

2010

2020

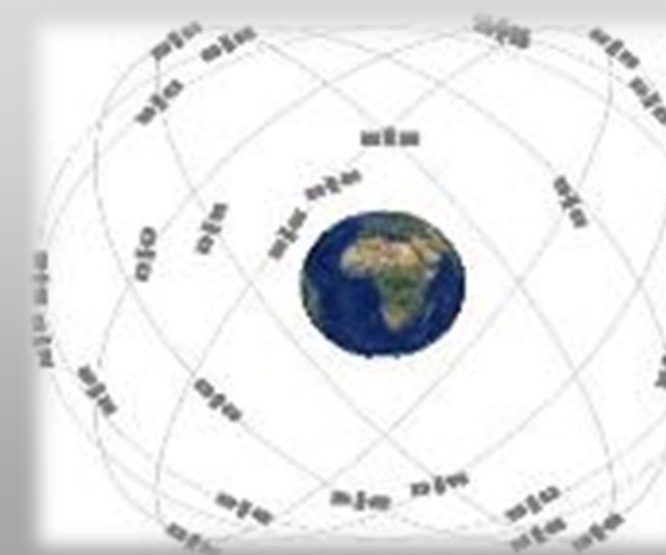
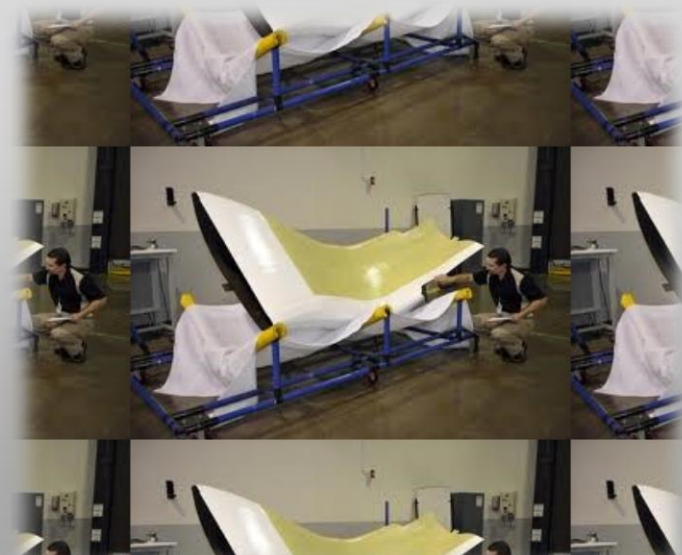
**PRESSURE CABIN  
AIRPLANE**

**COMPOSITES**

**FLY-BY-WIRE (FBW)**

**GPS  
NAVIGATION**

**AUTO GCAS  
SOFTWARE**



# LOCATIONS

## OHIO

### \*\*HUMAN PERFORMANCE

- USAF School of Aerospace Medicine
- \*Airman Systems

### \*AEROSPACE SYSTEMS

### HEADQUARTERS

### MATERIALS & MANUFACTURING

### SENSORS

## NEW YORK

### INFORMATION

## VIRGINIA

### AF OFFICE OF SCIENTIFIC RESEARCH

- London, UK
- Tokyo, Japan
- Santiago, Chile

## NEVADA

### AFWERX

- Las Vegas, NV
- Austin, TX
- Washington D.C.

## CALIFORNIA

### \*AEROSPACE SYSTEMS WEST

## HAWAII

### DIRECTED ENERGY

- Maui Research Site

## NEW MEXICO

### SPACE VEHICLES

### DIRECTED ENERGY

## TEXAS

### AIRMAN SYSTEMS

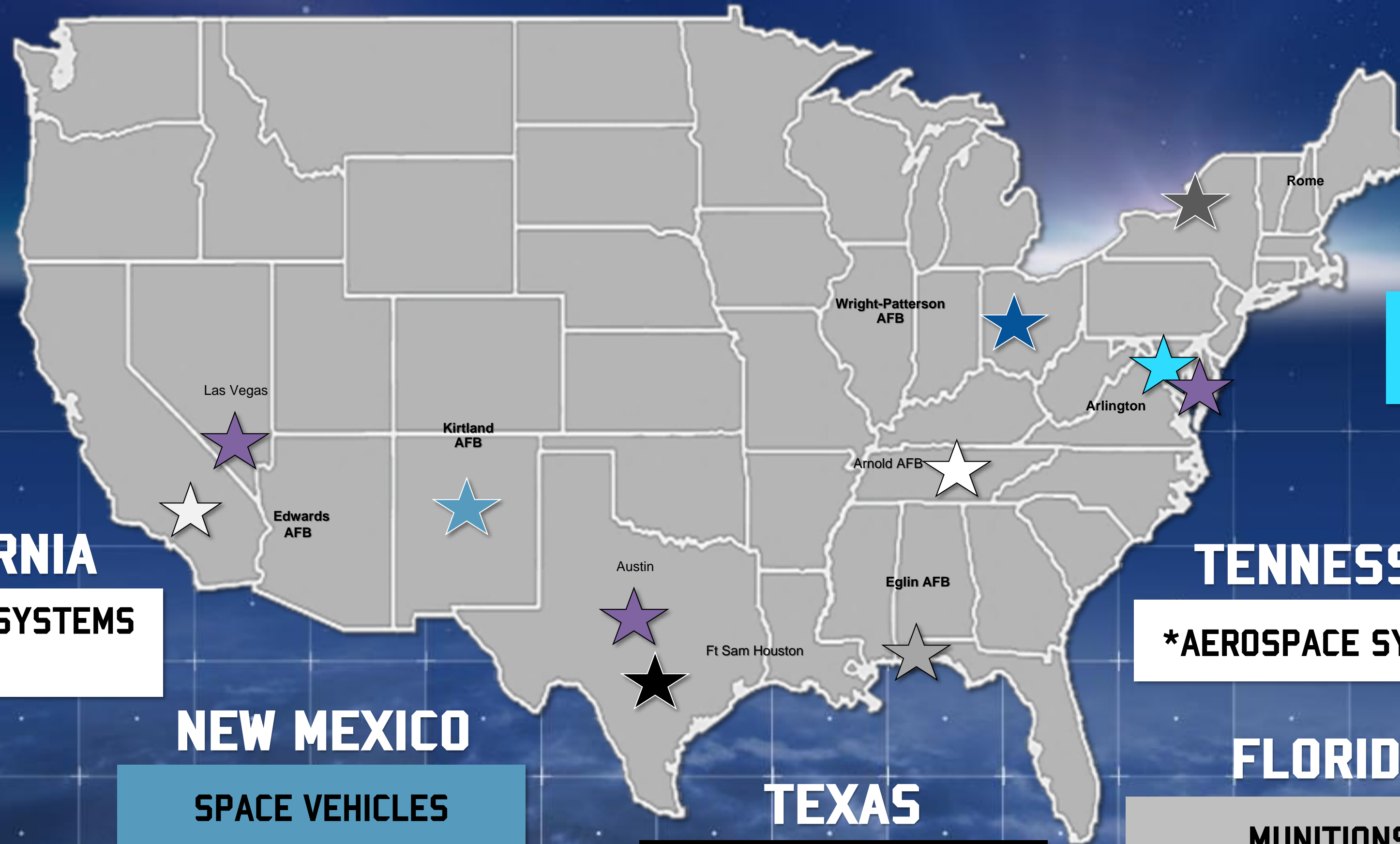
### \*\*HUMAN PERFORMANCE

## TENNESSEE

### \*AEROSPACE SYSTEMS

## FLORIDA

### MUNITIONS



# AFRL GLOBAL PARTNERSHIPS

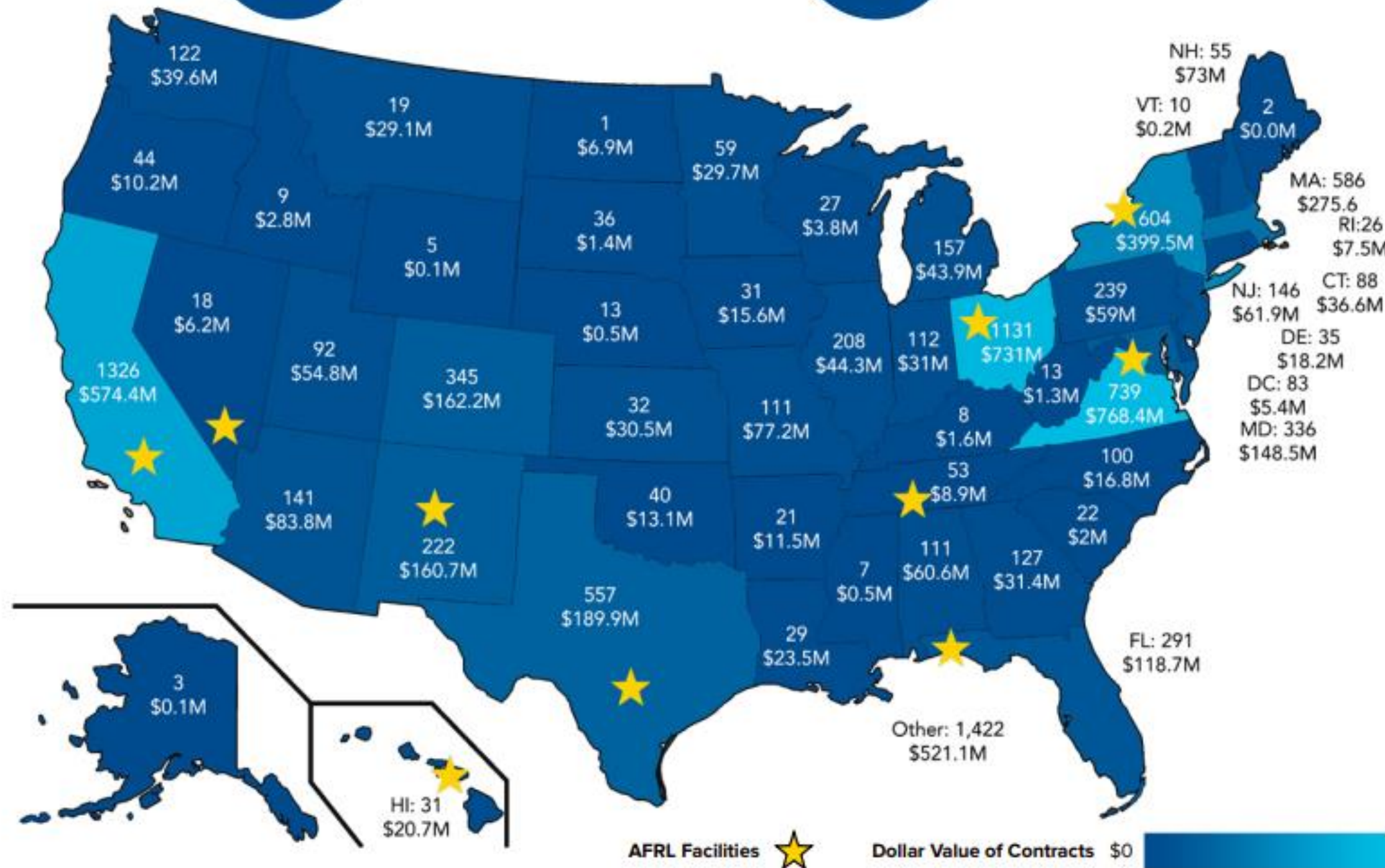
[READ MORE ON WAYS TO PARTNER WITH US](#)

## AFRL ACROSS THE COUNTRY...

## ....AND AROUND THE WORLD

**10,056** Contracts with industry, universities, and research institutions

**2,284** Agreements to share technologies, data, and discoveries



The map indicates number and total dollar value of active contracts in each state.

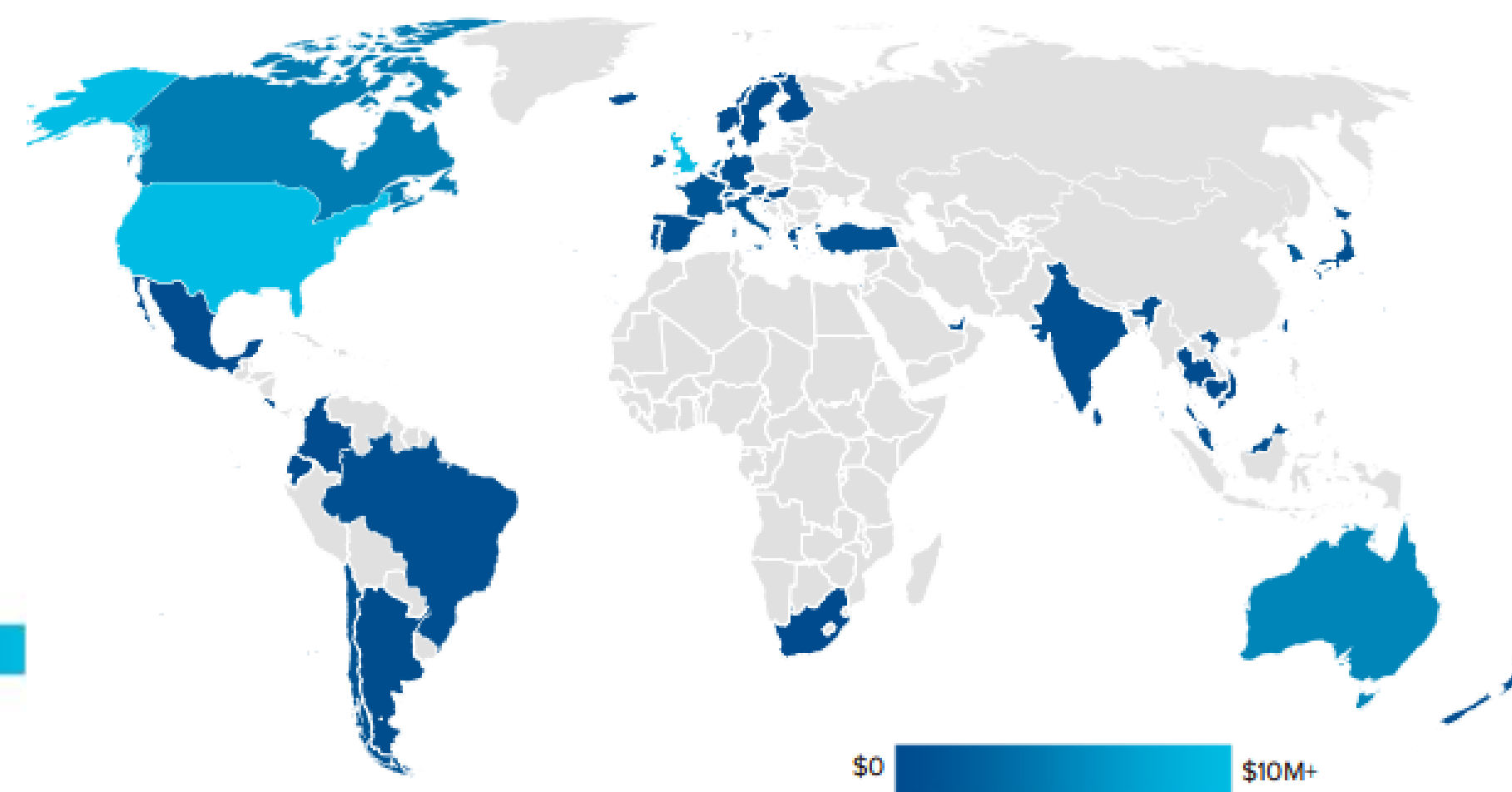
**52** Countries

**811** Grants & Agreements

**363** International Research Agreements

### Largest International Partners

Country	Grants/Agreements
United Kingdom	106
Australia	83
South Korea	37
Italy	27
Canada	26
Israel	18
Malaysia	17
Germany	17
France	16
Chile	16
Brazil	16



### WITH OFFICES IN...

- South America
- Asia
- Europe
- Oceania

*We must collaborate with higher education, government, and businesses to build upon each other's discoveries to **accelerate** S&T delivering capabilities to the warfighter.*

# IMPACTS OF EMERGING TECHNOLOGY AND SECURITY THREATS



“We must think in terms of tomorrow.”  
- General Henry H. “Hap” Arnold



# "THE TIMES, THEY ARE A CHANGING"

[READ MORE @  
AFWERX.COM](https://afwerx.com)



Adversaries  
e.g. Whole of Nation

National Defense Strategy

COVID-19

DoD/AF/USSF Response  
– Leap Ahead Speed

S&T 2030 Strategy –  
Transformation/ People/ Partnerships

Defense Production Act  
Testing/ Virtual/ Telework/ Limited Travel

USAF

USSF

One AFRL Supporting Two Services

Requirements

AFWIC vs MAJCOMs

Balance, prioritize S&T

AFWERX

Different mission than typical TD

Organize, Train, and Equip

**AREA**

**CHANGE**

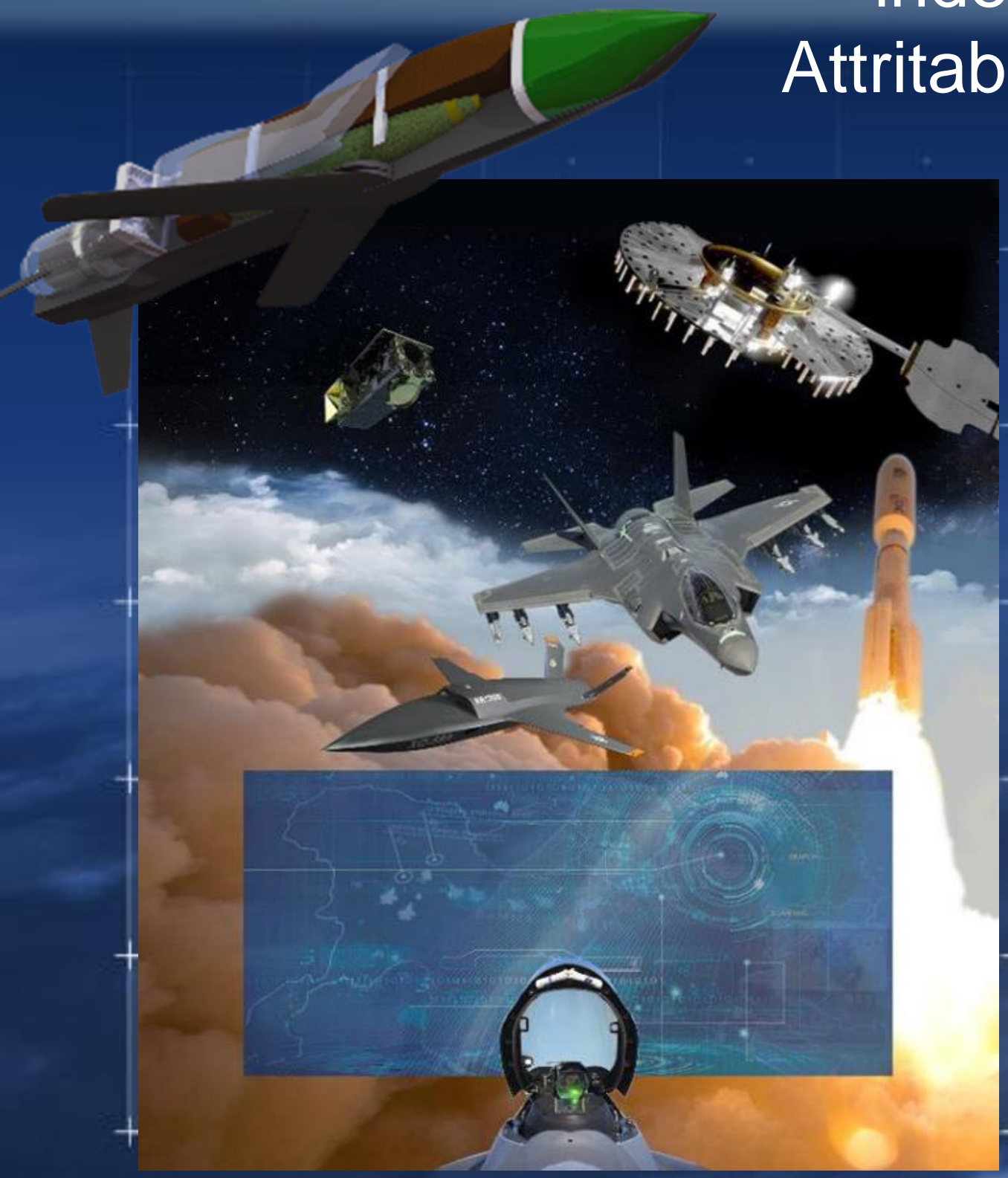
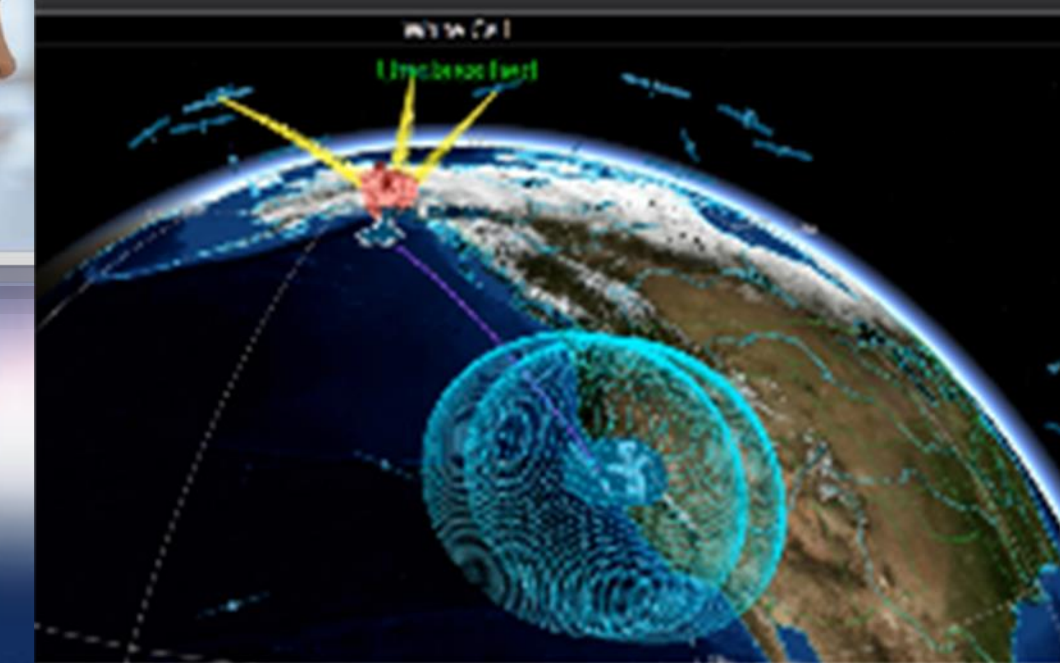
**IMPACT**

*As the globalization of S&T occurs, areas are changing fast- and so are we.  
AFRL remains agile in developing technology for the future fight*

# OUR FIGHT IS CHANGING

## TECHNOLOGIES FOR THE FUTURE FIGHT

- Connected sensing grid.... (ABMS/JADC2)
- Effect on target to include left of launch
- The tyranny of distance and time
- Contested environments - Alt-PNT, runway independent
- Attritable, low cost

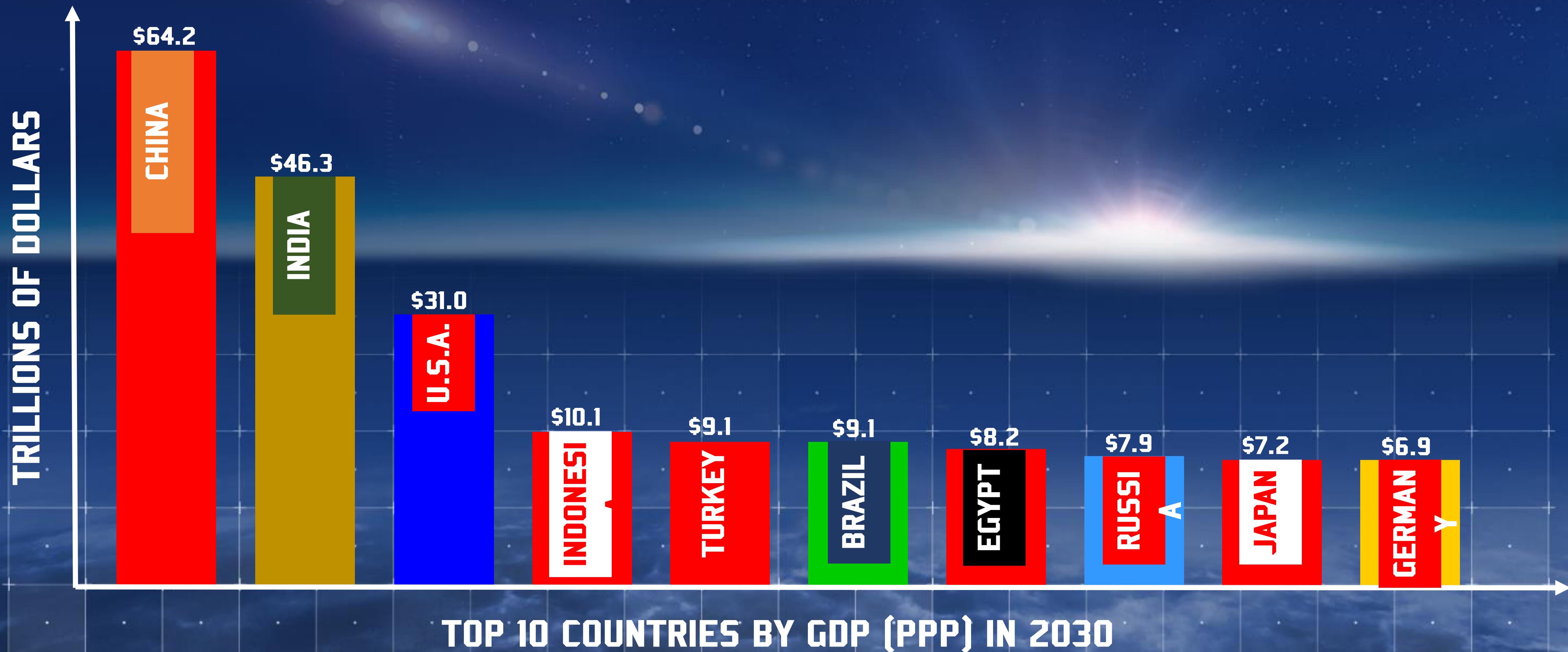


## AF FUTURES PRIORITY LIST

- Agile Combat Employment
- Family of Unmanned, Autonomous Systems
- Base Defense
- Palletized Munitions
- Airborne AMTI
- Alternative PNT
- Transition DARPA Program for Munitions
- Synthetic OTI
- High-Speed Vertical Takeoff and Landing
- Advanced Munitions

*AFRL is accelerating S&T on multiple fronts:*

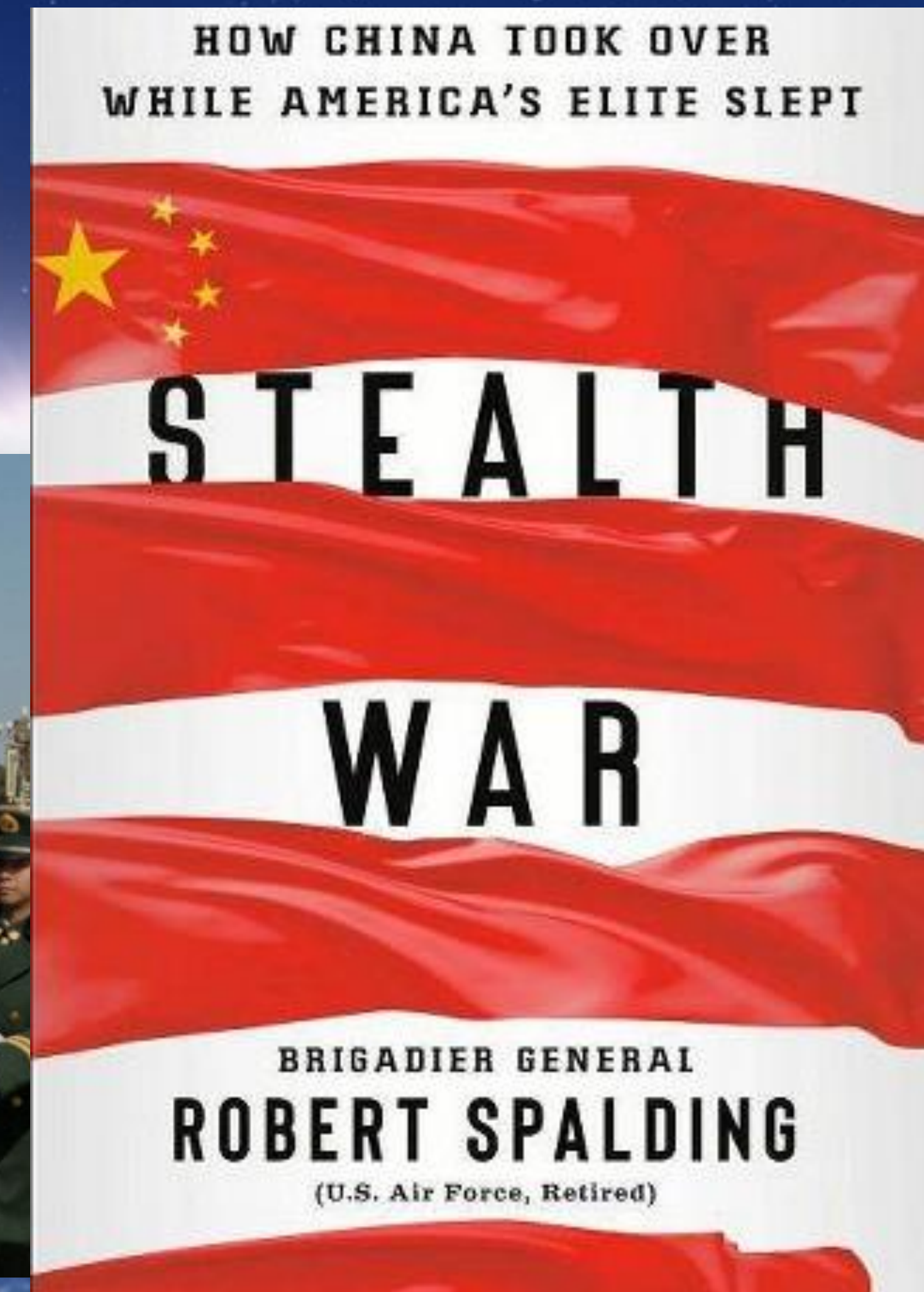
# UNCERTAINTY ABOUT OUR FUTURE...



*China's efforts to become the world's leader in S&T by 2050 make it a growing threat to the US's ability to maintain superiority in air, space, and cyberspace.*

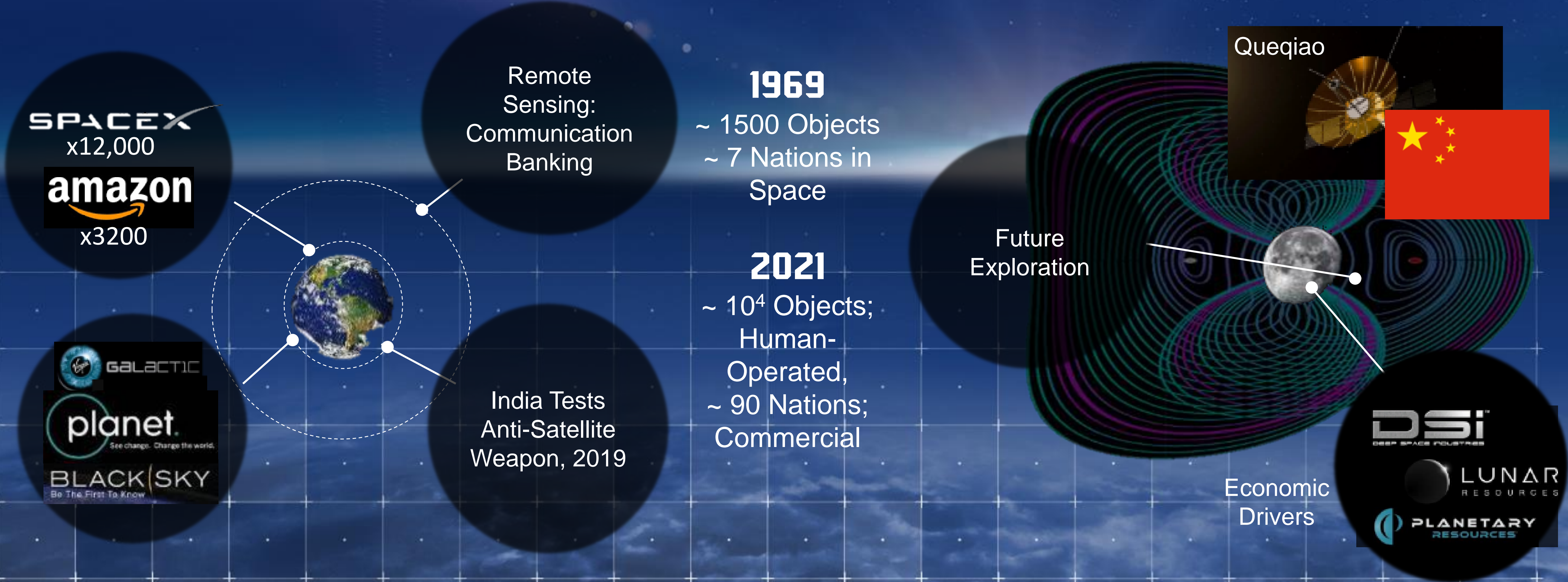
# PLAYING BY A DIFFERENT SET OF RULES

“China’s defense transformation has been guided by a principle known as **“military-civil fusion,”** which aims to allow the state to **seamlessly capitalize on private-sector advances.** Overseen personally by President Xi Jinping, the strategy can include exploitation of dual-use products or even forced technology transfers.”



*Our S&T partnerships make us a stronger force to be reckoned with. We are **diverse**. Diversity fosters innovation...and innovation does not happen in a vacuum!*

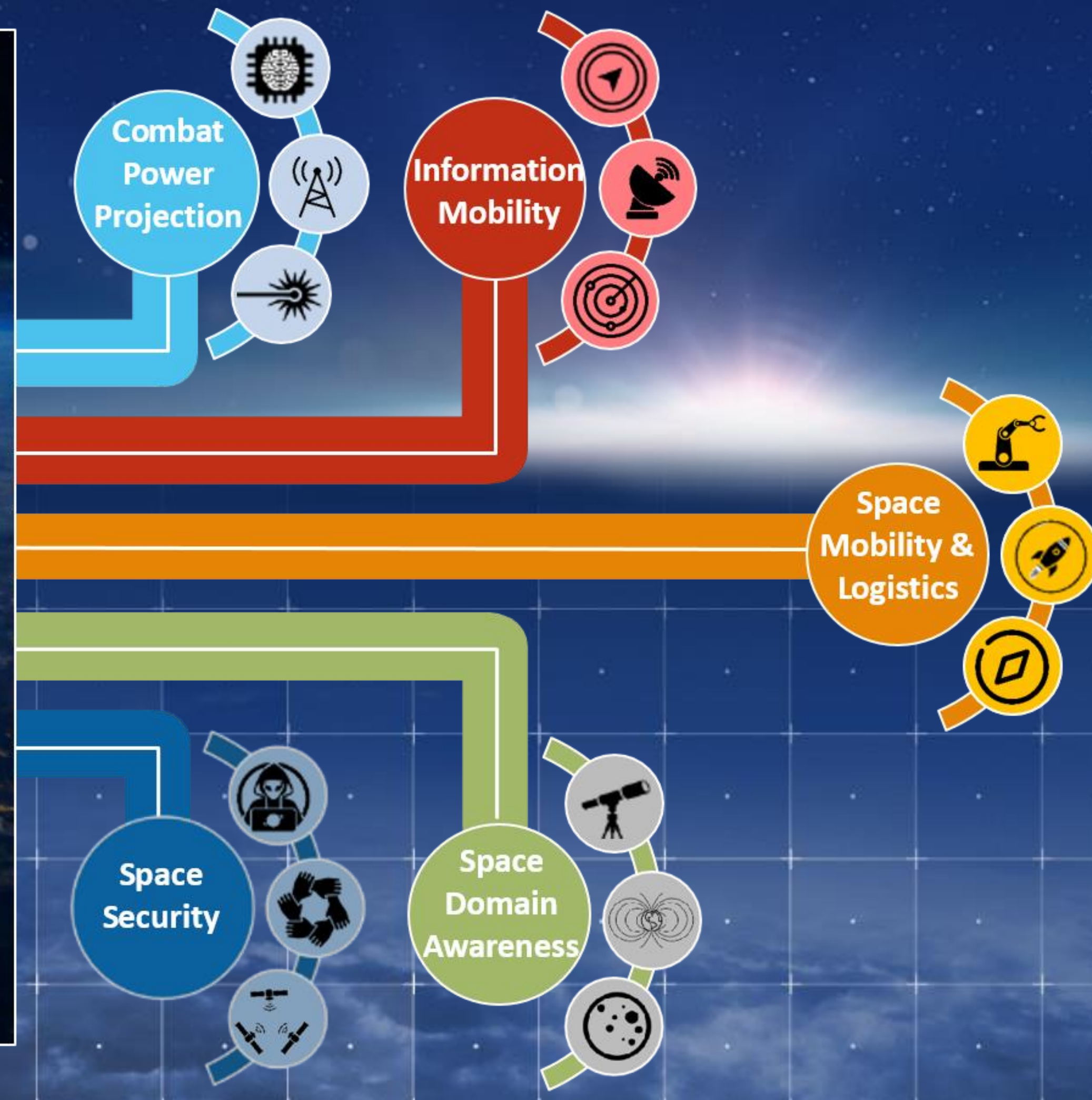
# SPACE IS CRITICAL TODAY FOR THE U.S. ECONOMY AND NATIONAL SECURITY



*Russia and China have weaponized space!*

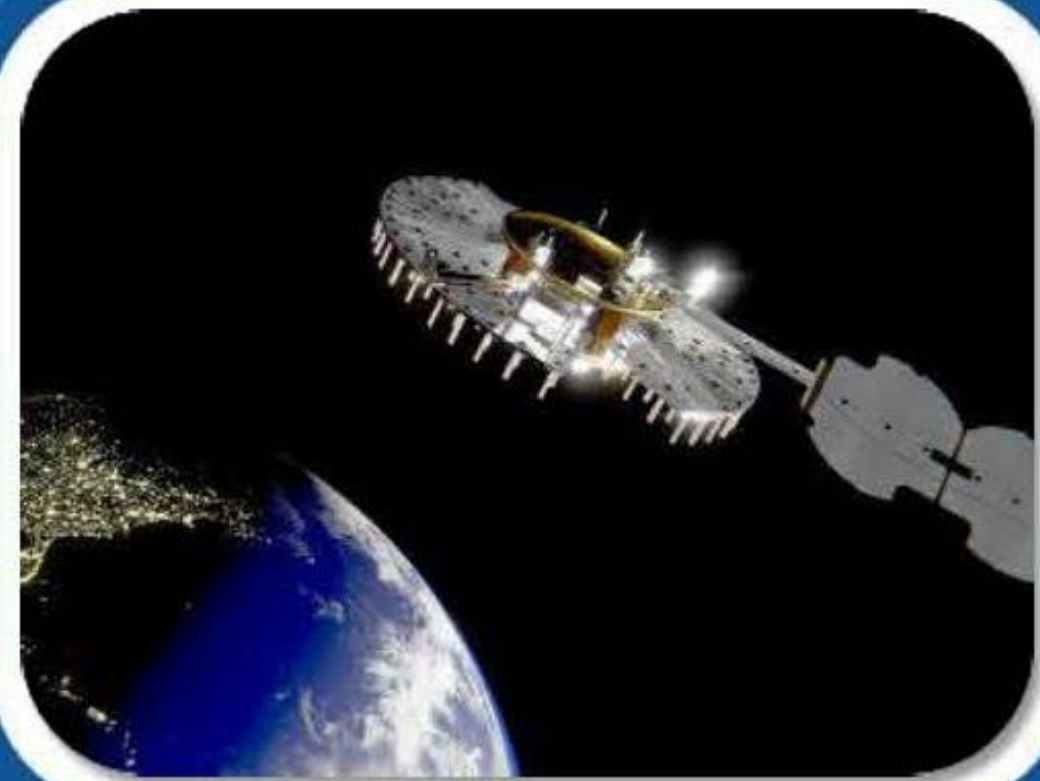
# SPACE AS A PART OF US STRATEGY

[READ THE SPACE CAPSTONE PRESENTATION HERE](#)



Military spacepower cannot unilaterally win wars, but like landpower, seapower, airpower, or cyberpower, its success, absence, or failure could prove **catastrophically decisive in war.**

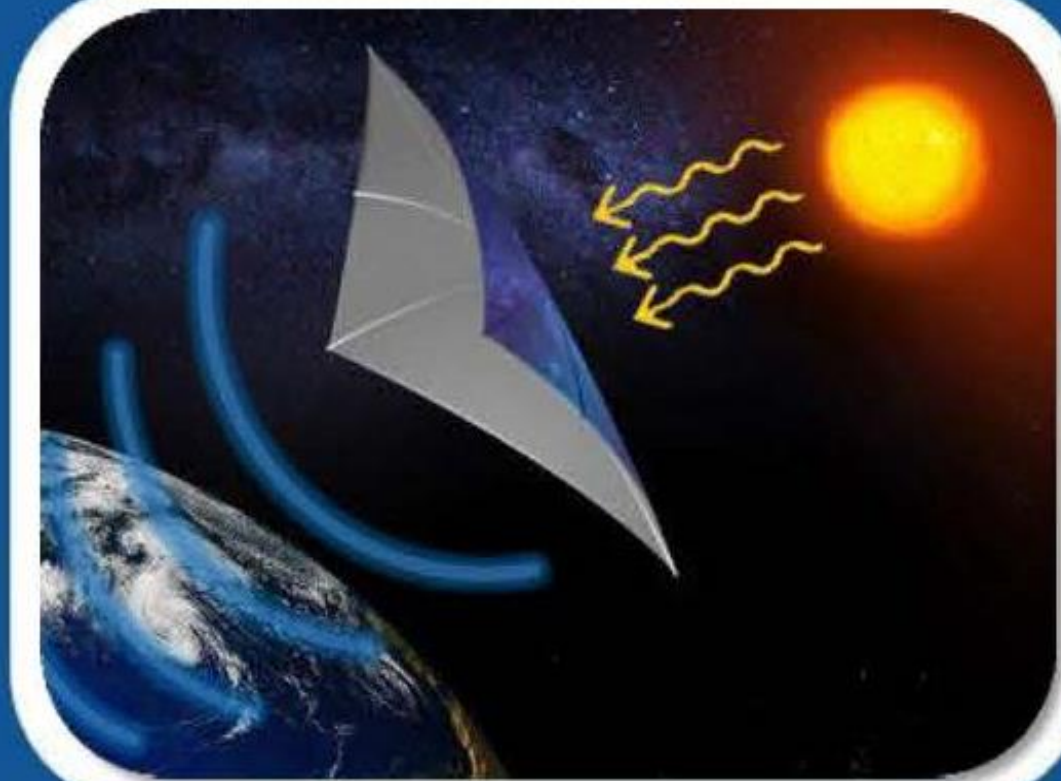
# AFRL ON THE FOREFRONT OF SPACE TECHNOLOGY



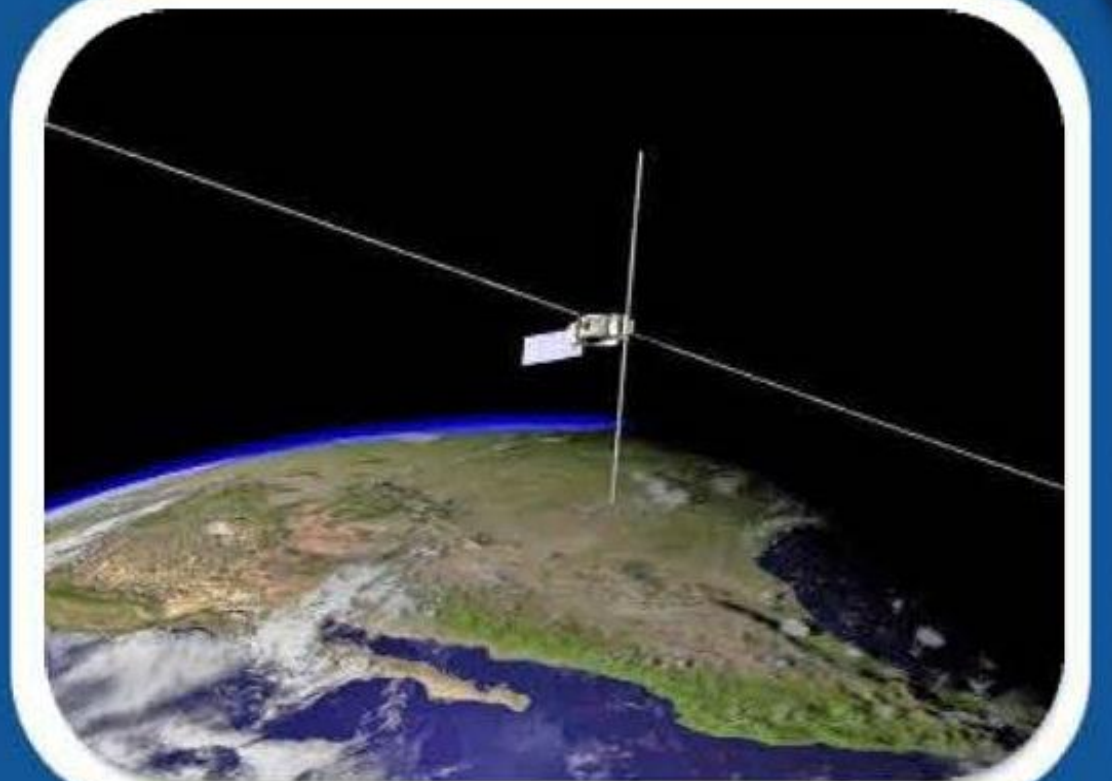
NAVIGATION TECHNOLOGY  
SATELLITE - 3 (NTS-3)



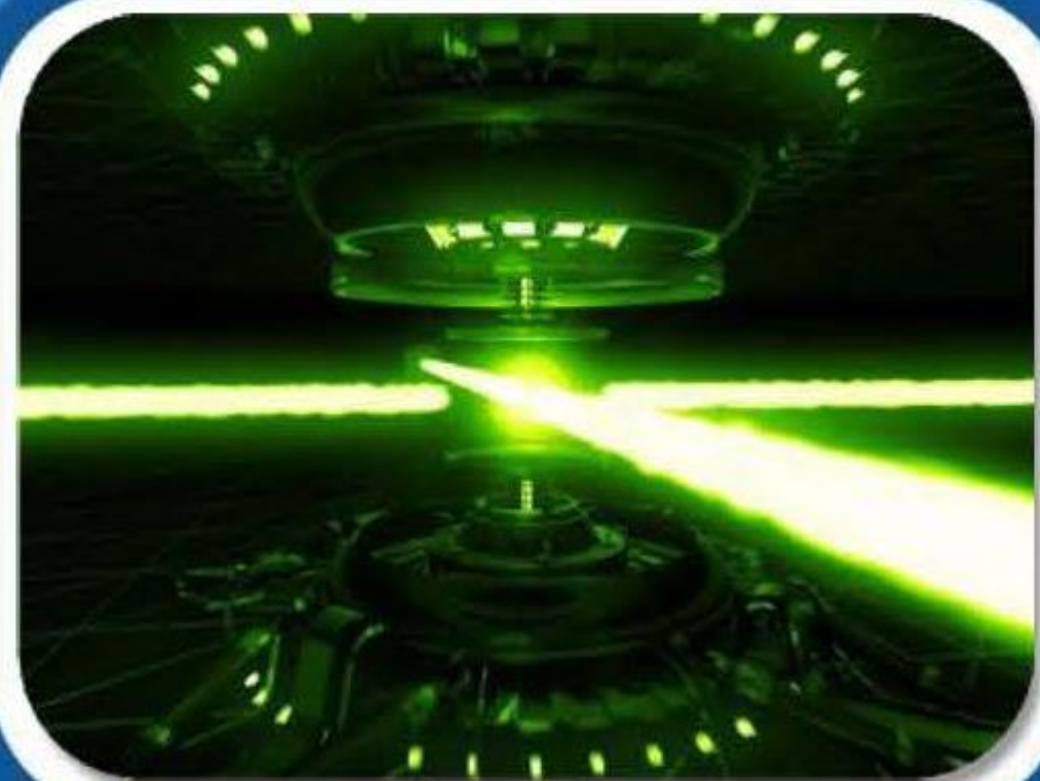
ADVANCED SPACECRAFT ENERGETIC  
NON-TOXIC (ASCENT) PROPELLANT



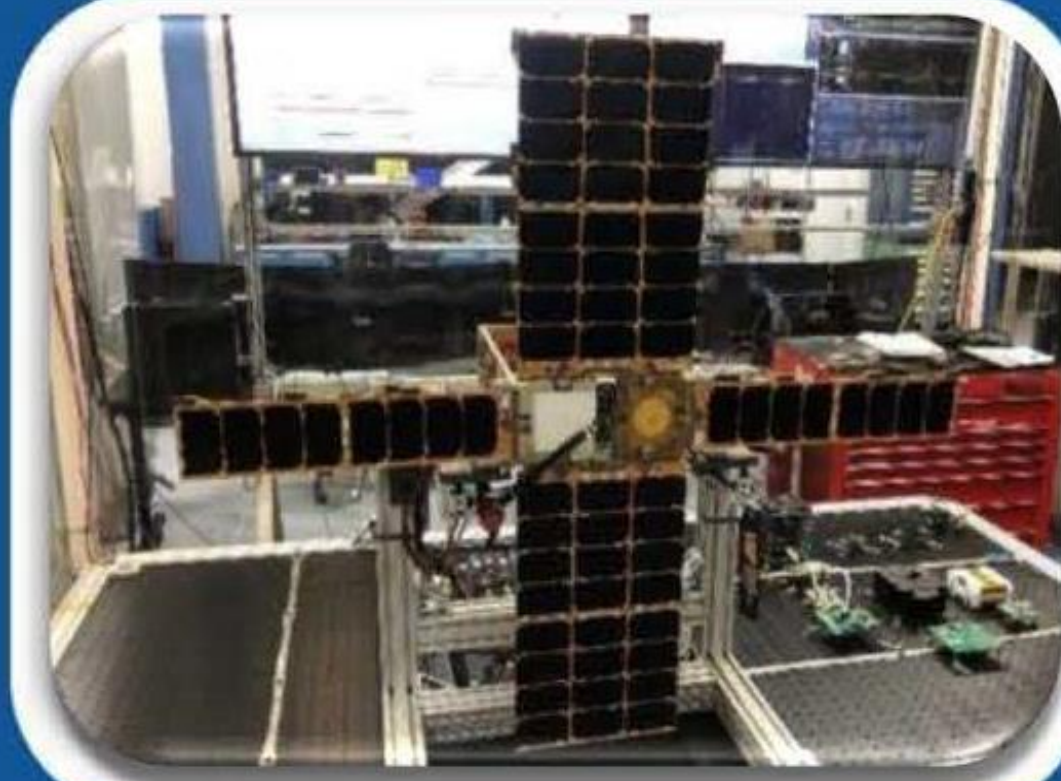
SPACE POWER BEAMING



DEMONSTRATION AND SCIENCE  
EXPERIMENTS (DSX) SATELLITE



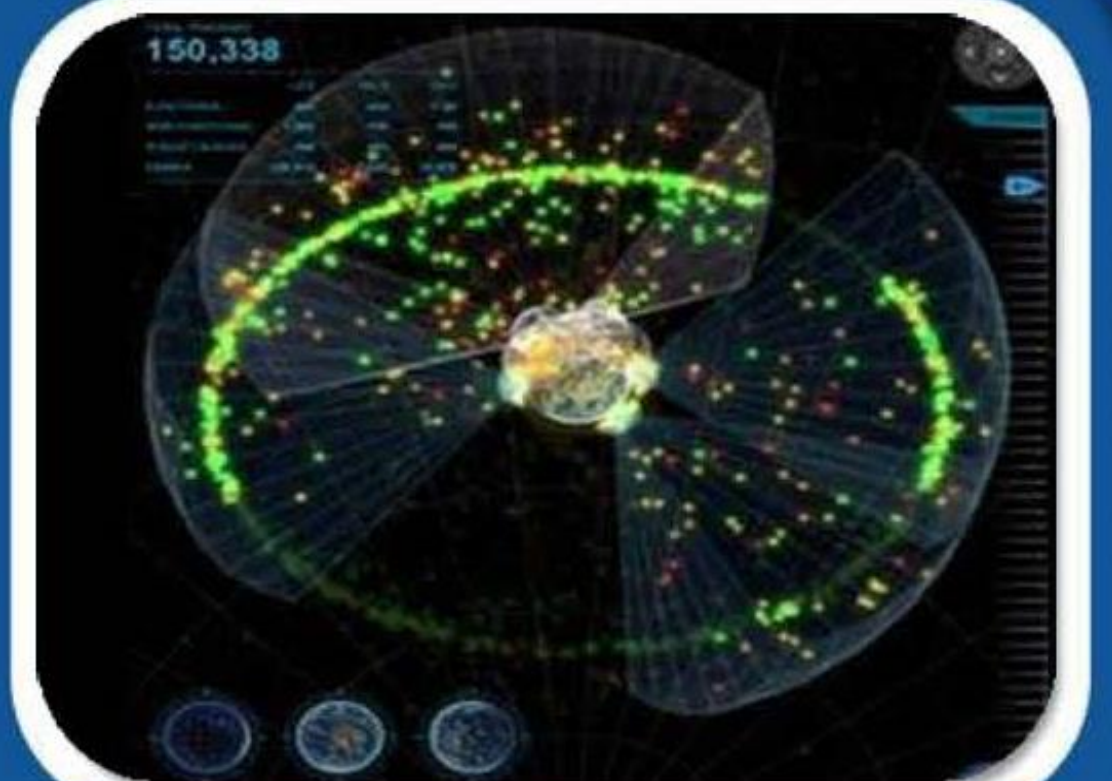
QUANTUM SENSING AND TIMING



SMALL SATS AND HYBRID  
ARCHITECTUES



SPACE LOGISTICS AND  
ADVANCED ROBOTICS



SPACE DOMAIN AWARENESS

# LOOKING FORWARD...COCOM

Not just this...

But achieving...

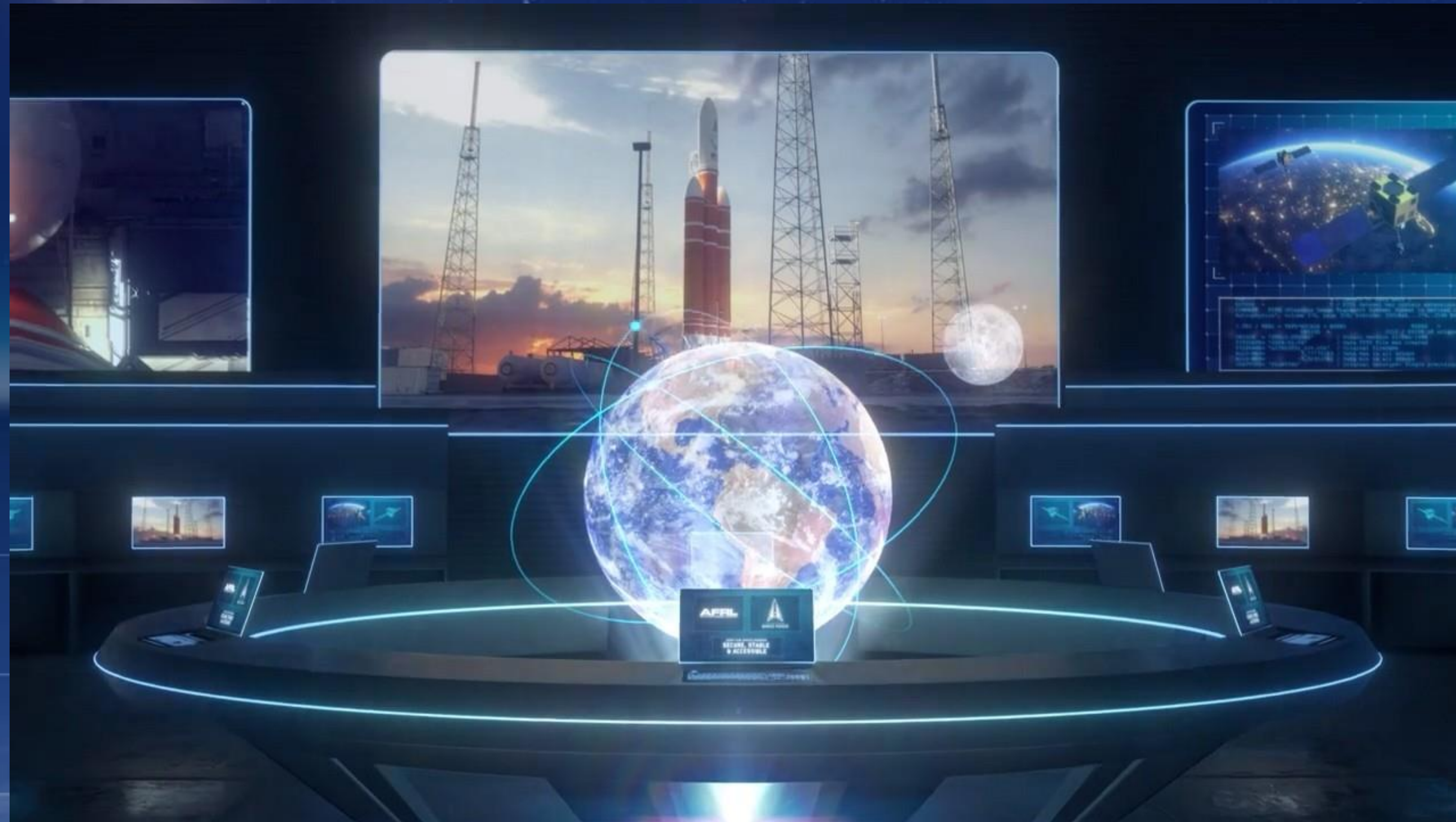
# THIS!



*Innovation does not happen in a vacuum!*



# THANK YOU.



**Media Inquiries [afrl.pa.inquiry@us.af.mil](mailto:afrl.pa.inquiry@us.af.mil)**  
**Business Inquiries [afsbirsttr-info@us.af.mil](mailto:afsbirsttr-info@us.af.mil)**  
**Higher Education Inquiries [collaborate@us.af.mil](mailto:collaborate@us.af.mil)**

# LET'S CONNECT!

## Air Force and Space Force Tech Connect

Connect with Air Force and Space Force  
Science and Technology

As part of the Science and Technology (S&T) 2030 Strategy, the S&T Front Door Service to Connect provides an opportunity to connect potential partners with DAF S&T experts and opportunities at <https://airforcetechconnect.org/>.

**Please share and encourage your internal and external network to submit their incredible ideas through the S&T Front Door!**

The team has also created a CAC enabled, SME Profile site: <https://smeprofile.usaftechconnect.com/>. You can securely provide your information, to include - organization, knowledge, skills and abilities, resume/CV (please no PII), and military operational experience - and then use a google-like search bar to search for others based on this same information.